CONCRETE *for*

Suburban and Farm Homes

CANADA CEMENT COMPANY LIMITED

TABLE OF CONTENTS

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TABLES

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CANADA CEMENT BUILDING, PHILLIPS SQUARE, MONTREAL

Country Folks CON

OWNERS of well-built concrete houses are enthusiastic about the year-round comfort and livability of their homes. They have found them warm and dry in winter, economical to heat, comfortably cool in summer.

Yes, there are many reasons for country owners of concrete houses to think their homes "just about right". They would all recommend that you give serious consideration to the use of concrete when you build or remodel your home.

For when you set out to build a new home, you demand high standards. You want it to be beautiful to look at, comfortable to live in, economical to maintain, and secure against fire and storm.

Your demands aren't easy to satisfy. But folks who have built their homes of concrete would have much to tell you about the advantages of concrete as a home-building material.

Undoubtedly all would point to the firesafety of concrete structures. Those who live on farms know only too well how important it is to eliminate as much as possible easily combustible materials from all farm construction. Lack of adequate fire-fighting facilities is less a worry to the farmer when his home is built of firesafe concrete.

Owners are proud that their choice of concrete for their homes has meant lower maintenance cost. You too would find that the extreme durability of concrete makes it possible to hold upkeep expense to the minimum.

Concrete is easily adapted to a wide range of climates and to a variety of architectural styles. No matter in what part of the country you live, your home can be "styled-in-concrete" just as you want it.

Perhaps you would like to have answers to several questions about the use of concrete, such as:

Can I build the kind of house I want with concrete?

What choices of exterior wall finishes are available?

How are concrete walls insulated?

What are some ways of building concrete floors over basements?

Can I have overall carpeting, hardwood, linoleum and other floor coverings over concrete subfloors?

How can I build a watertight basement?

Where can I get plans for a concrete house?

Answers to these and other questions relating to concrete houses are given in this booklet. Its purpose is to bring you information on new building practices and to tell you of the many advantages concrete offers in modernizing or building your home.

Like

CRETE HOMES

The photographs on these pages show only a few of the many styles of concrete homes that have been built on farms and suburban lots throughout the country.

An appearance of extra sturdiness is given this house by setting out the block at each of the corners. Every other horizontal mortar joint is given emphasis by tooling

Examples of vertically stacked concrete masonry units at left and checker-board pattern at right. Horizontal and vertical joints may be emphasized by tooling as desired. The surface may then be painted.

The horizontal joints enhance the beauty of this wall. Vertical joints are struck off flush and rubbed to match the texture of the block. Two coats of white portland cement paint brighten the surface and bring out the tooled joints.

Many wall patterns are possible with concrete masonry. The wall shown consists of two courses of 8-in. block followed by a course of 4-in. block. The pattern is repeated.

LASTING BEAUTY IN CONCRETE WALLS

PERHAPS few people realize the many attractive exterior wall finishes possible with concrete construction. Several of the more widely used finishes are described in the following paragraphs. One feature these finishes have in common is their long life, which results in low exterior maintenance expense. Concrete houses keep their new, fresh appearance for many years.

Interesting Walls of Concrete Masonry

Unusual wall finishes are obtained with concrete masonry by varying the mortar joints. A simple yet attractive effect is produced by tooling the horizontal joints and striking off the vertical joints flush with the wall surface. The vertical joints are then rubbed with a piece of carpet, cork or other rough material to obtain a texture similar to the concrete masonry units. When the wall is finished with two coats of portland cement paint, the horizontal joints which have been tooled appear prominently, whereas the rubbed vertical joints are toned down. This wall treatment is particularly suitable for houses where strong horizontal lines help to give the desired architectural effect.

Further variation in wall treatment results from tooling only each second or third horizontal joint and rubbing all the others. This treatment is used to achieve an effect of massiveness. Often course heights of the masonry are varied as, for example, alternating two courses of 8-in. high units with a course of 4-in. high units, and repeating to form a pattern.

Some people like the effect obtained by laying the concrete masonry in regular courses, tooling all joints, both vertical and horizontal, and then finishing the surface with two coats of portland cement paint.

Instructions for applying portland cement paint are given on page 8.

Cast-in-Place Wall Textures and Finishes

A variety of pleasing surface finishes are produced with cast-in-place concrete walls. Concrete takes the texture and lines of the material in which it is molded. Rough, rustic effects are produced by unfinished form lumber; smooth surfaces, by forms lined with plywood; and patterned surfaces, with special form linings.

Strips or molds nailed to the inside face of the outside forms produce novel patterns. Other textures are produced by revealing the aggregates on the surface by acid washing or mechanical means. Sometimes colored sand and gravel aggregates are used in the concrete. These when exposed give desired color effects.

Cast-in-place concrete walls may be left as they come from the forms. Interesting effects result from applying portland cement paints without disturbing the natural surface texture. Thin dash coats of portland cement stucco may be applied over concrete walls, producing interesting shadow effects but still revealing form markings. The plasticity of concrete makes many other textures and finishes possible.

MANY PORTLAND CEMENT STUCCO FINISHES AVAILABLE

A great variety of good-looking finishes are obtained with portland cement stucco, which bonds readily to concrete masonry walls and to cast-in-place concrete walls having a rough surface.

Stucco in its plastic state can be applied with a trowel or other tools to produce almost any texture. You can choose the texture and color you wish to suit the architectural style of your house.

Use only fast-color finish-coat portland cement stucco and have it applied by an experienced stucco contractor whose familiarity with the craft will assure beautiful and lasting results.

Detailed information on the preparation and application of portland cement stucco is available from the Canada Cement Company Limited and is sent free on request.

Rustic effects are produced on cast-in-place wall surfaces by use of unfinished form boards. The wall has been brightened and the texture and board patterns have been brought out by application of a portland cement paint.

Vertical lines were created in this cast-in-place wall by placing strips or inserts in the forms. A dash coat of portland cement stucco gives the wall an interesting texture.

Portland cement stucco finish for concrete walls is available in many colors and textures.

Concrete masonry is often used as a backing for brick facing. This 8-in. wall consists of a 4-in. brick facing and a 4-in. concrete masonry backup. Each seventh course of brick is a bond or header course.

Here a 4-in. stone facing is being applied over a 4-in. concrete masonry backing.

BRICK AND STONE FACINGS

For those who want a brick or stone facing on their house, concrete masonry provides an excellent backing. The facing material is generally 4 in. thick and the backing 4 in. or 8 in., depending upon whether the wall is to be 8 in. or 12 in. thick. Brick facing is bonded to the concrete masonry backing by a header course every sixth or seventh brick course. The brick in the header course are turned crosswise to extend into the backing. Stone facing is bonded to concrete masonry in a similar manner or by means of metal ties laid across the wall in the mortar joints.

PAINTING CONCRETE WALLS

Portland cement base paint is widely used as a decorative treatment on concrete walls. It also helps to make walls more weathertight. Portland cement paint coatings emphasize rather than conceal the interesting textures and markings of concrete surfaces. Other reasons for its increasing popularity are its durability and relatively low cost.

Portland cement paint* is available in different colors, with lighter tints generally preferred. It can be purchased through regular material and paint dealers. Delivered in powder form, it is mixed with water instead of oil or other vehicles. It must be applied according to approved methods worked out for portland cement paints. It is usually applied in two coats, a first or seal coat and a finish coat. The surface to be painted is dampened with water just before painting is begun; the paint is scrubbed into the surface with a brush having short, rather stiff fibers; the painted surface is kept moist for 48 hours following application. The principal steps in putting on portland cement paint are shown and described in the illustrations.

Suggested Specifications for Application of Paint on Exposed Concrete Masonry Walls is available free on request from Canada Cement Company Limited.

*Follow manufacturer's directions for preparing, applying and curing.

Left—Portland cement paint comes in powder form and is mixed with water according to paint manufacturer's directions. *Right*—A stiff fiber brush is recommended for applying portland cement paint.

Left—The wall surface to be painted is well dampened with water before the paint is applied. This insures a good bond between paint and wall. *Center*—The wall is painted a small area at a time. Joints are covered first, then the rest of the area. The paint is scrubbed into the surface. Two coats are applied. *Right*—After each coat of paint has hardened sufficiently, it is cured by keeping it damp for 24 hours.

BUILDING WALLS OF CONCRETE

CONCRETE MASONRY WALLS

Most people are familiar with concrete masonry, which now leads all forms of masonry in volume of construction. The building units used in concrete masonry construction are commonly called concrete block and are made by local concrete products manufacturers. The block are made in different sizes—a common size is 8x8x16 in., which lays up in courses 8 in. high and 8 in. thick. All block sizes indicated herein are approximate dimensions. Other block heights are 4, 5 and 6 in. They also come in thicknesses of 4, 10 and 12 in. Common lengths are 12 and 16 in. Half-length and quarter-length units are generally supplied by manufacturers or can easily be cut from full-length units to those sizes by the mason. Special block are usually furnished for door and window jambs, for corners and for building around joist ends. The 4-in. wide block are used in building non-load-bearing interior partitions and as backing for brick and stone facings. The 8-in. thick units are used in building load-bearing walls for one- and two-story houses. They are also used as backing for brick and stone facings. In two-story houses basement walls frequently are made 12 in. thick, using 12-in. thick block. Twelve-inch walls can also be constructed with a combination of 4- and 8-in. block.

Joints are straight and of uniform thickness.

Block Are Made of Both Heavy and Lightweight Aggregates

Concrete block made with sand, gravel, crushed stone and similar aggregates are known as heavyweight block. Block made with lighter weight aggregates such as cinders, burned shale or processed slag are known as lightweight block. In general, lightweight block weigh about two-thirds as much as heavyweight block of the same size.

Quality Block and First-Class Workmanship Mean High-Grade Walls

Concrete block used in building exterior walls and interior load-bearing walls should be of top quality, with a compressive strength of 700 to 1,000 lb. per sq.in. This means that each 8x8x16-in. concrete block, either lightweight or heavyweight, will carry a load of more than 45 tons—a load much greater than it will ever have to carry in a house. Block should have sharp, straight edges and corners and be dry when placed in the wall.

It is not the purpose of this booklet to give instructions on how to lay concrete block. However, the reader will be interested in some characteristics of good workmanship:

Face shell mortar bedding is recommended for most concrete masonry jobs.

Horizontal or bed joints will be straight and of uniform thickness (usually $\frac{3}{8}$ in. thick).

Vertical joints will be of uniform thickness ($\frac{3}{8}$ in. thick).

Face-shell bedding is commonly used—which means that only the inner and outer face shells will be covered with mortar. The mortar does not extend entirely through the wall. There is a space between the inner and outer strips of mortar. This helps produce a dry wall.

Joints will be well filled with mortar. Some mortar will be squeezed out when the block are set and shoved against the block previously laid.

After the mortar stiffens it is tooled. This operation compresses the mortar and forces it tightly against the edges of the block, producing dense, weathertight joints.

Mason laying up a concrete masonry wall of 8x8x16-in. block.

Tooling the mortar gives the wall a neat appearance and produces dense, watertight joints.

Masons like a plastic, workable mortar for laying concrete masonry walls.

Masons are very particular about the consistency of the mortar they use. They insist upon a workable, plastic mix which is made by adding the correct amount of mixing water and by thorough mixing of the ingredients.

Mortar Mix Is Important

For laying concrete masonry walls use one of the recommended mortar mixes shown in the following table.

TABLE 1—RECOMMENDED MORTAR MIX
Proportions by Volume

Type of Wall	Cement	Hydrated lime or lime putty	Mortar sand in damp, loose condition
Ordinary	1-masonry cement*	....	2 to 3
	or		
	1-portland cement	1 to 1¼	4 to 6
Subject to extremely heavy loads, violent winds, earthquakes or severe frost action. Isolated piers.	1-masonry cement* plus 1-portland cement	.....	4 to 6
	or		
	1-portland cement	0 to ¼	2 to 3

*Federal Specifications SS-C-181b, Type II
CSA Standard A-8

Doors and Windows

Either metal or wood door and window frames may be used in concrete masonry walls. Jamb block are regularly furnished for both types of frames. In one method of construction frames are set in place and the wall is built up tightly against them. A variation of this method is to build openings of proper size in the wall and insert frames later. In another method of construction, rough temporary frames or bucks are built into the wall. When the wall is completed these are removed and replaced with permanent frames.

Sills and Lintels

Sills are often precast in a concrete products plant. They are made the proper width for different windows.

Precast concrete sills are being used in this house.

Jamb block insure tight fit around metal window frames.

Frames for doors and windows can be built into concrete masonry walls.

Sills also may be cast-in-place concrete. In all cases the sills are given a wash or slope so that water will drain off quickly and completely. They are made to project about an inch beyond the wall surface and are provided with a drip on the lower outer edge so that rain water running off the sill will fall free rather than run down the face of the wall, possibly leaving an unsightly stain.

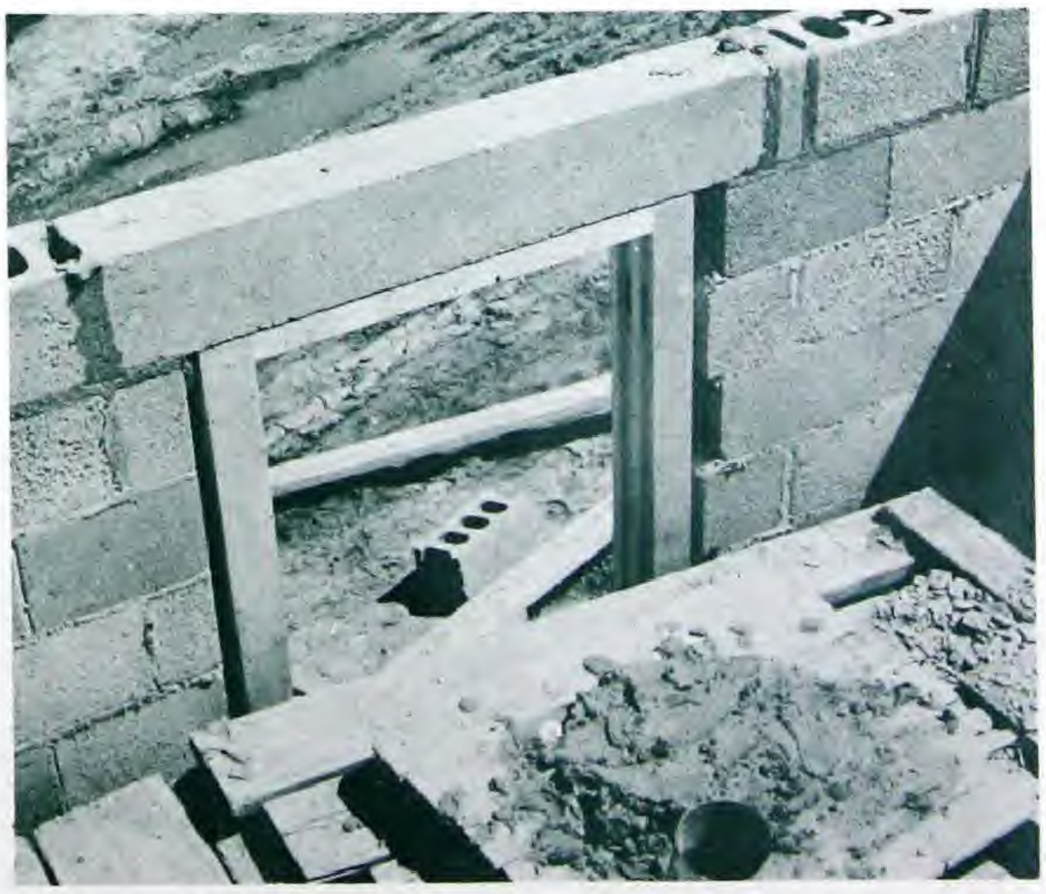
Lintels, or reinforced concrete beams over door and window openings, may be either precast in a products plant or cast in place on the job. They are designed and reinforced according to the load to be carried.

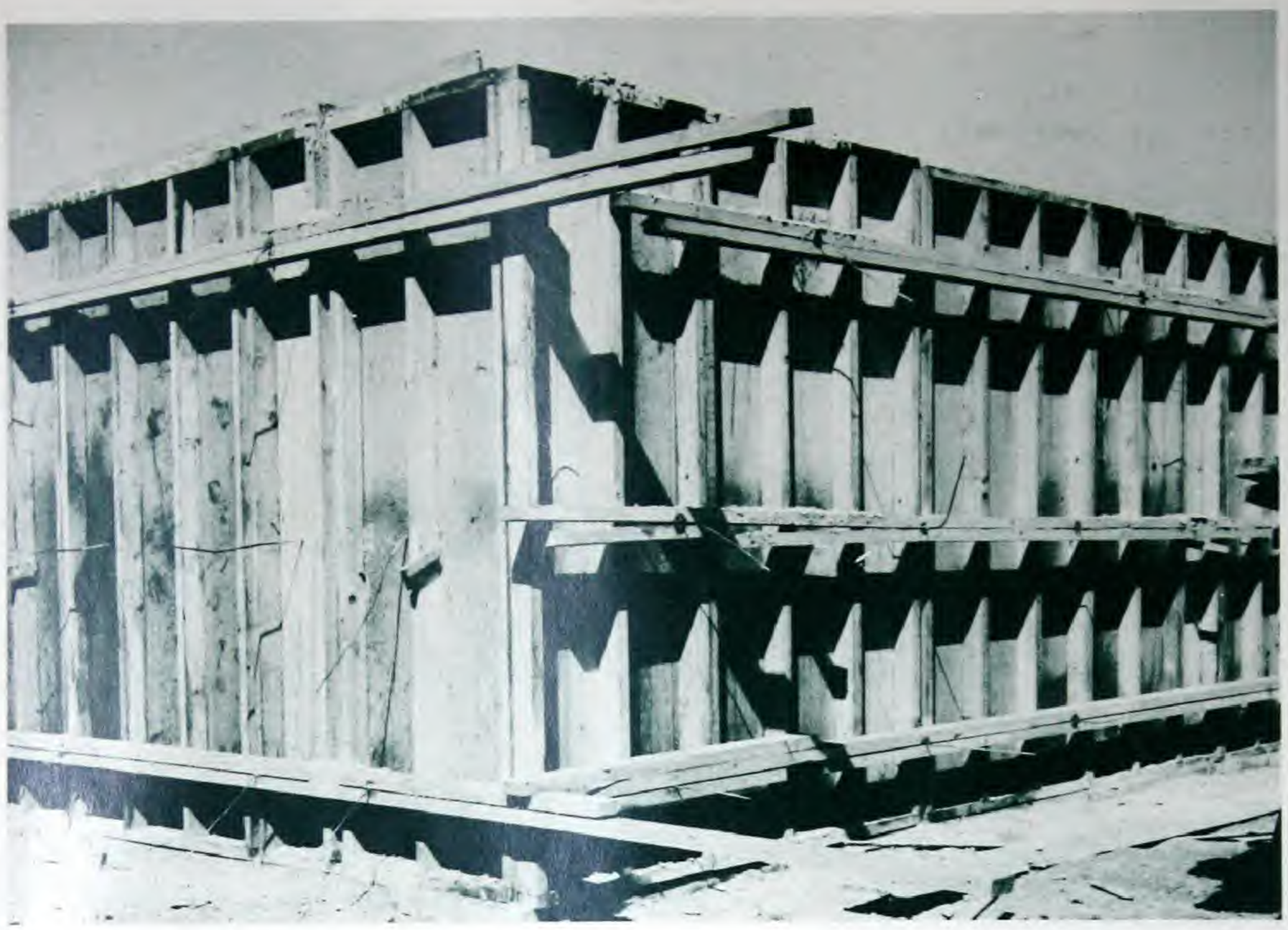
CAST-IN-PLACE CONCRETE WALLS

Cast-in-place concrete walls are made with concrete mixed on the job or delivered to the job ready-mixed. The concrete is put in forms where it hardens and becomes a permanent part of the structure. Cast-in-place concrete walls may be solid, hollow or ribbed. Solid walls are just what the name implies. Hollow walls are walls with air spaces within them. The air spaces may be continuous, as in the case of two walls separated by an air space. Inner and outer walls of such construction are usually each about 4 in. thick and are tied together with noncorrosive metal ties cast in the concrete. The

Concrete sills may be cast in place.

Precast concrete lintels are often used over door and window openings.





Sectional forms are commonly used in constructing cast-in-place concrete walls.

air space in hollow walls may be in the form of cells or cores. Ribbed walls usually are rather thin walls with concrete ribs or studs cast at regular intervals for added strength.

Forms for Cast-in-Place Concrete Walls

Several types of forms have been developed for constructing cast-in-place concrete walls. Some builders will prefer one type of form, others will like another. Forms, whether lined with dressed and matched lumber, plywood, metal or other materials, should be carefully built and strongly braced to avoid leaks and to insure straight, true walls. Sometimes form facings are selected to produce certain textures and markings on the surface as described on pages 6 and 7.

Reinforcement for Cast-in-Place Concrete Walls

Proper distribution and placing of reinforcing steel in cast-in-place concrete walls above grade are important. This is a matter for the designing engineer to determine (reinforcement is not commonly used in cast-in-place basement or foundation walls). Usual reinforcing material is steel bars or wire mesh. In general, bars are run both horizontally and vertically and are placed so that they will be at least 1½ in. from the wall face. They are wired together at intersections as often as needed to keep them in place. Additional reinforcement is added over the top, under the bottom and in the jambs of all door and window openings.

Wall Thickness

Wall thickness for basement and foundation walls for farmhouses will usually be 8 in., although some builders regularly make such walls 10 or 12 in. thick. Exterior walls above grade and those interior walls that carry floor or roof loads are usually made 6 to 8 in. thick. Non-load-bearing interior walls are usually 4 in. thick. Wall thicknesses vary considerably with local building experience and practice.

Using the Proper Mix

In building cast-in-place walls concrete is mixed and placed so that the walls will be strong and watertight with uniform surfaces when the forms are removed. Usually the concrete is mixed in about the following proportions: 1 sack of portland cement, 2 cu. ft. of sand and 3 cu.ft. of crushed rock or stone up to 1½ in. in size. Mixing water is measured carefully because the strength, watertightness, durability and other good qualities of concrete are largely governed by the amount of water used per sack of cement.

Tests show that strong, watertight concrete is obtained when not more than 4¾ gal. of water, including that in the sand, is used per sack of cement. Allowance is made for water in the sand because it is free to act with the cement. We suggest:

If sand is	Use
Dripping wet	3¼ gal. water per sack of cement
Average wet	4 gal. water per sack of cement
Damp	4¼ gal. water per sack of cement

The above proportions will usually result in a mixture of mushy consistency which will have good working qualities. Sloppy mixtures are avoided in first-class construction. They are apt to produce porous concrete.

Placing Concrete in Forms

Special care is taken in placing concrete in the forms. It is placed in layers usually about 12 in. deep and is deposited in the forms at close intervals not exceeding 6 ft. This handling of the concrete aids in preventing separation of the materials and assures a uniform mixture throughout the wall. The concrete is spaded or vibrated as it is deposited. This operation settles the concrete into a dense mass which is strong and watertight with surfaces free from defects.

It is best to complete the wall in one continuous operation if possible, in order to avoid construction joints. When this cannot be done the concrete is leveled off in the forms and the top surface roughened while still soft. In resuming work any scum or loose material is first removed from the top surface, which is then dampened and covered with a ½-in. thickness of 1:2 mix of a cement-sand grout—after which the placing of concrete is resumed. These precautions help to insure a watertight joint where old and new layers meet.

Openings for Doors and Windows

Openings for door and window frames are made in cast-in-place concrete walls by setting plank frames or bucks in the forms and removing them after forms are taken off. Then the finished frames of wood or steel are inserted in the openings.

Sills and lintels are usually cast as part of the wall.

Inserting Nailing Blocks

Where furring strips are to be attached to inner wall surfaces, small wood nailing blocks are tacked on the inner form face at proper intervals. When forms are removed, furring strips can be nailed to these blocks, which are held firmly in the concrete. Methods of finishing walls are discussed below.

INTERIOR WALL FINISHES FOR CONCRETE HOUSES

The inside walls of a concrete house are usually finished in the conventional manner—with plaster or dry wall coverings which are painted, papered, textured or given any other surface treatment that may be required in the decorative scheme. Plaster finishes are applied on wood or metal lath, plasterboard, rigid insulation or other acceptable bases which are fastened to 1x2-in. wood furring strips attached to inside faces of all exterior walls. These strips form an air space between the concrete walls and the interior finish, giving the wall good insulation value. The furring strips are placed 16 in. apart and are run parallel to each other from the floor to the ceiling. Dry wall finishes—such as wallboard, rigid insulation, plywood and other interior wall finish materials—are also applied over and fastened to furring strips. These strips are not used on partition walls. Plaster or dry wall material is applied direct or nailed to wood blocks placed in the wall surface or laid in the mortar joints.

Removing the forms. Any fins left on the wall can be removed by rubbing with a carborundum brick.

COMFORT IN COUNTRY HOMES

Well-built concrete houses are warm and cozy in winter and comfortably cool in summer.

PROPER INSULATION ADDS COMFORT TO ANY HOUSE

Often you have heard someone describe one house as being "warm and cozy" and another as being "cold as a barn". The houses referred to may have been much alike in size and appearance. The difference lay in the way they were built. Any house, whether constructed of wood, brick, metal, stone or concrete, can be warm and cozy if it is properly insulated. Houses easily kept warm at low fuel cost are constructed so that heat lost through walls and roof will be kept to a minimum. Such houses will usually be comfortably cool in hot weather, because proper insulation is just as effective in keeping heat out of the house in summer as in retaining heat in winter.

Where the Heat Goes

In a normally constructed residence without special provision for insulation, the heat loss will be distributed approximately as follows:

35 per cent through doors and windows
30 per cent through the roof
20 per cent through exterior walls
15 per cent through infiltration around doors and windows

How to Prevent Needless Heat Loss

To have an easily heated house, provision must be made to cut down loss of heat through and around doors and windows and through roof and walls.

Heat losses around and through doors and windows can be reduced materially by use of storm windows, storm doors, weatherstripping, double glazing of glassed areas, and so on.

Heat losses through the roof are commonly reduced by placing insulation between the attic ceiling joists or in the roof structure. Various forms of loose fill, reflective, rigid and blanket types of insulation are used for this purpose. For example, in an average house with a pitched roof and unventilated attic the use of a 1-in. thickness of rigid insulation over the ceiling joists will reduce heat losses through the ceiling by at least 50 per cent. Local builders are usually familiar with the kinds and amounts of insulation materials used in your community.

Flat slab concrete roofs are insulated by laying insulation material, usually of the rigid-board type, over the concrete slab. This insulation is then covered with a watertight roofing which is applied in accordance with the manufacturer's directions.

Heat losses through walls are also reduced through the use of some suitable insulating material applied to or incorporated in wall construction. Since there have been many questions about heat losses through various types of wall construction, this subject will be discussed in some detail.

Methods of Insulating Concrete Walls

Granular fill insulation—such as granulated cork, vermiculite and similar material—is frequently placed in the cores of concrete masonry walls and in the air spaces of hollow double walls.

Blanket insulation is placed between the furring strips on exterior walls. Rigid insulation board is normally placed over the furring strips and serves as a plaster base or as an interior finish without plaster. Reflective insulation must have an air space to be effective and therefore is used with furring strips.

Many manufacturers of insulation furnish instructions on proper application of their materials. They also can give you data on the insulating value of their products.

Measuring Heat Transmission

In figuring heat losses through walls heating engineers commonly refer to the heat transmission coefficient, designated by the letter *U*. The lower the coefficient the lower the heat loss.

The amount of wall insulation needed will vary in different parts of the country. In some sections where temperatures are mild the year around or where the building is used only during summer months, concrete walls are sometimes used with no added insulation. In most sections of the country, however, a lower heat loss is desired to reduce fuel costs and to promote greater comfort in both cold and warm weather. In general, a *U* value of 0.25 or lower is considered desirable for residences.

Heat loss through a concrete masonry wall is decreased greatly by filling the cores with granular type insulation.

Warm Concrete Walls

Concrete masonry units with heavyweight aggregates have heat losses very similar to those of equal wall thicknesses of brick. An 8-in. thick wall of heavyweight units and an 8-in. brick wall both furred and plastered have *U* values of 0.32. This is considered too high for most localities. By plastering over ½-in. rigid insulation furred out from the wall, the value of *U* can be reduced to 0.24. Lightweight concrete masonry walls 8 in. thick, with plaster applied directly to the inside surface and painted with two coats of portland cement paint on the outside, will have a *U* of 0.32. With furring and plaster, this same wall will have a heat transmission coefficient of 0.25 or less. By using a ½-in. thick rigid insulation over the furring strips as a plaster base, *U* of this wall is reduced to 0.19. Similar results are obtained by using blanket or reflective insulation. Granular fill in the cores and plaster furred out on metal lath will reduce *U* to approximately 0.17.

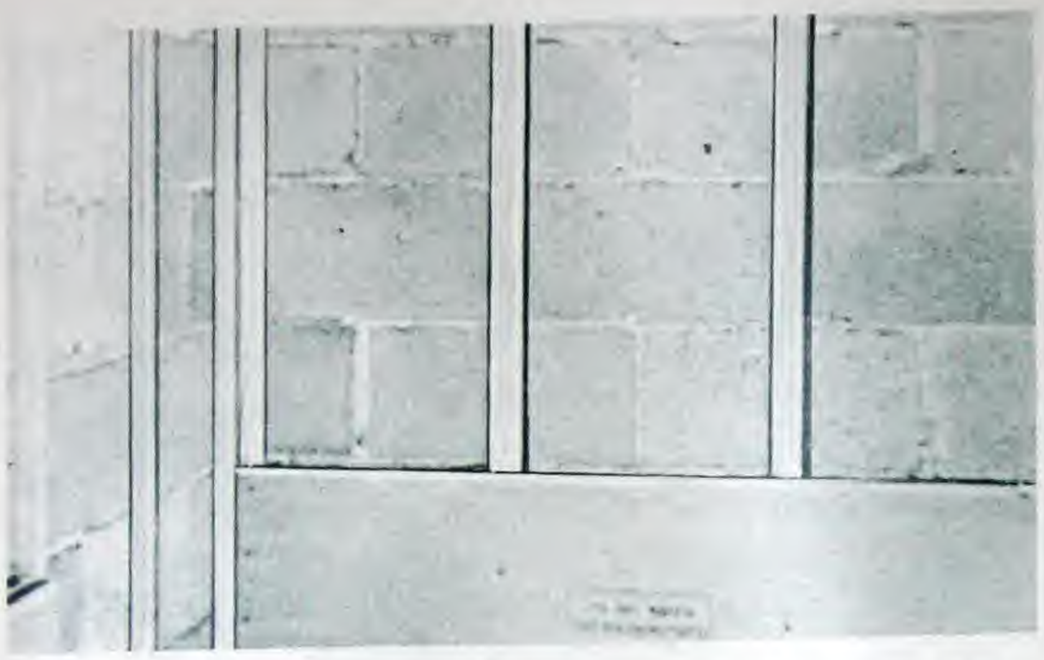
An 8-in. thick cast-in-place concrete wall with ½-in. thick rigid insulation furred out and plastered has a *U* of 0.25. By filling the 2-in. air space in a hollow double cast-in-place wall with granular fill, *U* is 0.15.

The *U* of both concrete masonry and cast-in-place walls can be lowered further by proper use of additional insulating materials. Heating engineers generally agree that for residences little is gained by reducing *U* below 0.15.

Condensation—Why It Occurs

Condensation is closely related to insulation. Condensation is often called "sweating" and may occur in any type of home—brick, wood, metal, stone or concrete—if enough insulation is not provided to maintain the surface temperature of the wall at nearly the same level as the air temperature in the room. Sweating occurs when the temperature falls below the dew point of the air. Steamed windows in winter and pitchers of cold water which gather beads of moisture in summer are examples of sweating. The dew point or temperature at which condensation takes place varies with the temperature of the air and the amount of water vapor

Batting is often used for insulating concrete walls.



It is usual practice to fur out all types of masonry walls to provide an insulating air space between the wall and plaster or other inside finish. The use of rigid insulation as a plaster base further increases the insulation.

in the air, commonly known as humidity. For example, with a room temperature of 70 deg. F. and a humidity of 60 per cent the dew point is 55.6 deg. F. To prevent condensation under these conditions, wall surface temperature must remain above 55.6 deg. If the temperature of the room remains the same, 70 deg. F., and the humidity increases from 60 to 80 per cent, the dew point or condensation temperature becomes 64 deg., and the wall surface temperature must be kept above 64 deg. if condensation is to be avoided.

Condensation Within the Wall Structure

Condensation may occur within any type of wall because of vapor penetration and may cause damage to insulation not protected by a vapor barrier. For example, vapor from a room can go through plaster and condense on or in a masonry wall. Vapor barriers are placed on the warm side of the insulation. Metallic foil and paper thoroughly coated with suitable asphalt are effective vapor barriers. Some aluminum paints properly applied are satisfactory. The need for vapor seal depends on prevailing temperature and humidity conditions and on the degree to which the structure is insulated.

Further information on calculating heat losses and wall temperatures is contained in *Guide of the American Society of Heating and Ventilating Engineers*. Similar information as it applies to concrete masonry walls is given in an information sheet entitled *How to Calculate Heal Transmission Coefficients and Vapor Condensation Temperatures of Concrete Masonry Walls*, (CP-68), published by the Portland Cement Association, available free on request.

CONCRETE SUBFLOORS

Concrete floors have appropriately been called "the key to firesafe homes". A house is truly firesafe only if it has firesafe floors as well as firesafe walls and firesafe roof. Farm and suburban fires exact heavy toll in lives and property damage. Each day an average of 10 farm and suburban people lose their lives in farm and suburban fires and a quarter of a million dollars worth of farm and suburban property goes up in flames. Many farm and suburban fires start within the house, mostly because of faulty heating plants. Such fires can often be prevented when farm and suburban houses have incombustible concrete floors.

Concrete floors make a house stronger and more rigid. With concrete floors a house is free from vibration. The fall of heavy footsteps and the romping of playful children will not jar concrete floors and make dishes and furniture rattle and chatter.

Concrete Floors for Your Home

At the mention of concrete floors, the first reaction of many people is unfavorable. Yet these same people would be very uneasy if they had to stay overnight in a hotel that was not firesafe, or if their children went to school in a combustible building. Many people who enjoy the comforts and security of modern firesafe hotels are not conscious of the fact that the floors under the carpets or rugs they stand on are of concrete construction. Floor coverings over the concrete subfloor may be hardwood, linoleum, aspnalt tile, ceramic tile

Scatter rugs over colored concrete floors make comfortable homey rooms.

or some other material. All lie smooth and last long on a concrete subfloor because it provides an even, rigid base. This means long wear from the coverings.

People who live in houses with concrete subfloors like them and usually prefer them to any other kind of floor. Even people who think they wouldn't care for concrete floors soon get to like them after living on them.

Floor Coverings for Concrete Subfloors

You can have almost any floor covering or finish you want in a house with concrete subfloors. Common practice is to use hardwood finishes, overall carpeting and rugs in living rooms and dining rooms; linoleum, asphalt tile, rubber tile, ceramic tile and similar coverings in kitchens, bathrooms and hallways; and plain concrete finishes for basement and utility room floors. However, you can make your own selection of coverings for each room—have a different one in each room if you want.

Wood Floor Coverings

The usual method of putting down wood floors on concrete subfloors is to nail them to wooden strips or sleepers embedded in the concrete surface or anchored to the concrete with metal clips. Hardwood flooring such as parquet, finished at the factory and ready for use when laid, is cemented directly to the concrete subfloor with a mastic prepared for the purpose.

A flagstone effect was gained in this floor by marking irregular joints in the concrete surface and filling them with darker colored mortar. The sections marked off were given various surface textures. This floor well illustrates how concrete is adaptable to any style of interior.

Carpeting and Rugs

Carpets and rugs are customarily laid over pads which add to the life of the covering and give a sensation of walking over luxurious deep-pile rugs. Overall carpeting is usually stretched and tacked down to wooden strips around the edge of the floor. These can be embedded in the concrete or nailed to wood plugs set in the concrete. The concrete subfloor is given a smooth troweled finish.

Linoleum, Asphalt Tile, Rubber Tile, Cork Tile

Concrete subfloors make an excellent foundation for linoleum, asphalt tile, rubber tile and similar floor coverings. These materials are cemented directly to the

Overall carpeting is a popular covering.

This hardwood floor is laid over a concrete subfloor.

Left—Nailing floor boards to wooden sleepers embedded in the concrete subfloor. *Center*—Cementing factory-prepared flooring to concrete subfloor. *Right*—Asphalt tile are cemented directly to concrete subfloor.

subfloor with a special mastic*. When such coverings are to be applied, the concrete subfloor is given a smooth troweled finish or a fine broomed texture.

Concrete Tile, Ceramic Tile, Slate, Flagstone, etc.

A concrete subfloor is required for the proper setting of tile, slate, flagstone and other finishes of this kind. The concrete subfloor is given a rough finish or a coarse, broomed texture to provide a good bond for the mortar used in setting these floor materials. Just before setting, a slush coat of neat cement grout is broomed into the surface of the hardened concrete base slab. Before the grout hardens, the base is covered with a mortar setting bed about ¾ in. thick. This consists of 1 volume of portland cement and 3 or 4 volumes of sand mixed with sufficient water to obtain a plastic working consistency. Only as much mortar is spread at one time as can be covered with the flooring material before the mortar begins to harden. The floor covering units are placed upon and tapped into the setting mortar until true and even. Then joints between are filled with mortar composed of 1 volume of portland cement, not more than 1 volume of sand and the required mixing water. Mortar is forced into joints until they are well filled. All surplus mortar is removed before it hardens and the faces of the floor materials are cleaned.

Plain Troweled Finish

Floors in recreation rooms, utility rooms and other rooms that serve similar purposes are often given a plain troweled cement finish. A plain concrete topping not less than 1 in. thick is placed over the concrete subfloor, the surface of which has been roughened by a broom or other means to insure proper bond between base and topping. The surface of the concrete subfloor is cleaned and dampened, and a neat cement grout is broomed on just before the topping is placed. Concrete topping mix consists of 1 volume of portland cement, 1½ to 2 volumes of sand and 1½ to 2 volumes of aggregate up to ⅜ in. in size. Only sufficient mixing water should be added to produce a stiff mushy consistency. The topping is brought to the required level by screeding and is compacted by wood floating. After the surface has become quite stiff and the water sheen has completely disappeared, the surface is given final finish with a steel trowel, the less troweling the better. As soon as the topping has hardened sufficiently, it is covered with 1 in. of wet sand or other material. This is kept wet constantly for 7 days when normal portland cement is used, or for at least 3 days when high early-strength portland cement is used. Curing is very important in building durable, dust-free concrete finish floors.

Other Concrete Floor Finishes

Concrete floor finishes can be colored by incorporating mineral pigments in the topping mixture. Colored finishes are also obtained by applying inorganic acid stains which have been developed for this purpose and which are used in accordance with manufacturer's directions.

Cementing linoleum to concrete floors.

*Follow manufacturer's directions.

SUPPORTED REINFORCED CONCRETE SUBFLOORS

FLOORS which are built over a basement or over other open spaces and supported on walls or beams along the edges or at intermediate points are called supported concrete floors. Several methods have been developed for constructing supported reinforced concrete floors. Space limitations permit the description of but four types in this booklet. The choice of which type of floor to use in any locality will be governed largely by the experiences of local builders. Since reinforced concrete floors are designed to fit the load, the span and other conditions, it is recommended that builders secure the services of competent structural engineers to design them and to supervise construction. Careful planning is essential. For example, provision must be made in advance for conduits for electric wires, water or heating pipes and other utility connections that will be built in or will pass through the concrete floors. It is costly to cut passageways for these connections after the concrete hardens—they should be planned in advance.

Slab Floors

Slab floors are floors of uniform thickness, usually from 4 to 6 in., depending on load and span—thicker slabs being required for longer spans and heavier loads. The slab is reinforced with steel bars or mesh, the size, amount and spacing of which are specified by the designing engineer.

If you were to visit a slab reinforced concrete floor under construction just before and while the concrete was being placed, you probably would see a platform made of panels of plywood, boards or other materials supported on joists, girders and posts—all rigidly braced so that they sustain the weight of the concrete as well as that of workmen and loaded wheelbarrows. Over the platform, or forms as they are called, you would observe a network of steel reinforcing bars or mesh held up about an inch above the forms. Some of the bars would be bent up near the supports; some would be wired together at intersections so they would not be displaced when the concrete mixture is deposited. There would be an orderliness about the placing of the reinforcement which denotes careful design and construction. You would also observe conduits for electric wires, boxed-in openings for heating ducts and pipes, connections for gas, water and soil pipes, and so on, all signs of careful planning and competent workmanship.

You would next observe the placing of the concrete either mixed on the job or delivered to the site ready-mixed. It would be of about the proportions shown in Table 2 on page 31. The mixture would be of plastic, mushy consistency. The entire floor thickness would be placed in one continuous operation, using the same mixture of concrete throughout. The concrete would be carefully spaded or vibrated around the reinforcement, pipes and other objects to be embedded in the concrete

Concrete slab floor of uniform thickness is being laid.

slab. The concrete would be leveled off with a strike-board resting on guides placed so that a level floor of uniform thickness would be obtained. This operation would be followed by wood floating, which evens up and compacts the surface. Finishing from this point would be made according to the final finish or covering desired. The various concrete finishes given concrete subfloors for the different coverings are described in the section on "Concrete Subfloors—Key to Firesafe Country Homes", on pages 16 to 18. After finishing, the concrete slab is moist-cured by keeping the surface constantly wet by sprinkling or with a covering of wet sand or other material. This moist-curing is continued

In the concrete block joist type of floor the block are arranged in rows.

Reinforcement is placed in the spaces between rows of block. Later this space will be filled with concrete, forming reinforced concrete joists.

After the reinforcement and connections for plumbing and other utilities are set, concrete is placed, filling the spaces between the rows of block and covering the block to a depth of 2½ in.

for 7 days if normal portland cement is used and 3 days if high-early-strength cement is used.

Concrete Block Joist Floors

The concrete block joist type of supported concrete floor for houses will usually have a nominal thickness of from 6 to 8 in. The 6-in. thick floors are used for floors having spans up to about 15 ft., and the 8-in. thick floors for spans up to 20 ft. This type of floor gets its name from the fact that it contains rows of concrete block between which reinforced concrete joists are cast.

If you were to visit the building of such a floor you would see parallel rows of concrete block laid side by side with the cores running horizontally. The rows of block would be supported on planks held up by joists and posts. There would be spaces about 5 in. wide between the rows of block in which there would be reinforcing bars, some bent up near the supports. There would be other smaller reinforcing bars or mesh over the block.

Conduits for electric wires, plumbing, heating and other utility connections to be embedded or to pass through the concrete floors would be in place. When these preparations are completed, a concrete mixture of mushy, workable consistency would be deposited over the floor area, filling the spaces between the rows of block and covering the block to a depth of 2½ in. The concrete mixture would be spaded, vibrated or otherwise worked into all corners, around reinforcing bars, utility connections, etc., to make sure of their complete embedment. The concrete mixture and the placing, finishing and curing would be the same as for flat slab construction.

The advantage of the concrete block joist type of floor is its relatively light weight because hollow concrete block are used. The underside of such floors is a plain surface to which plaster can be applied directly if a plastered ceiling is desired.

Precast Joist Concrete Floors

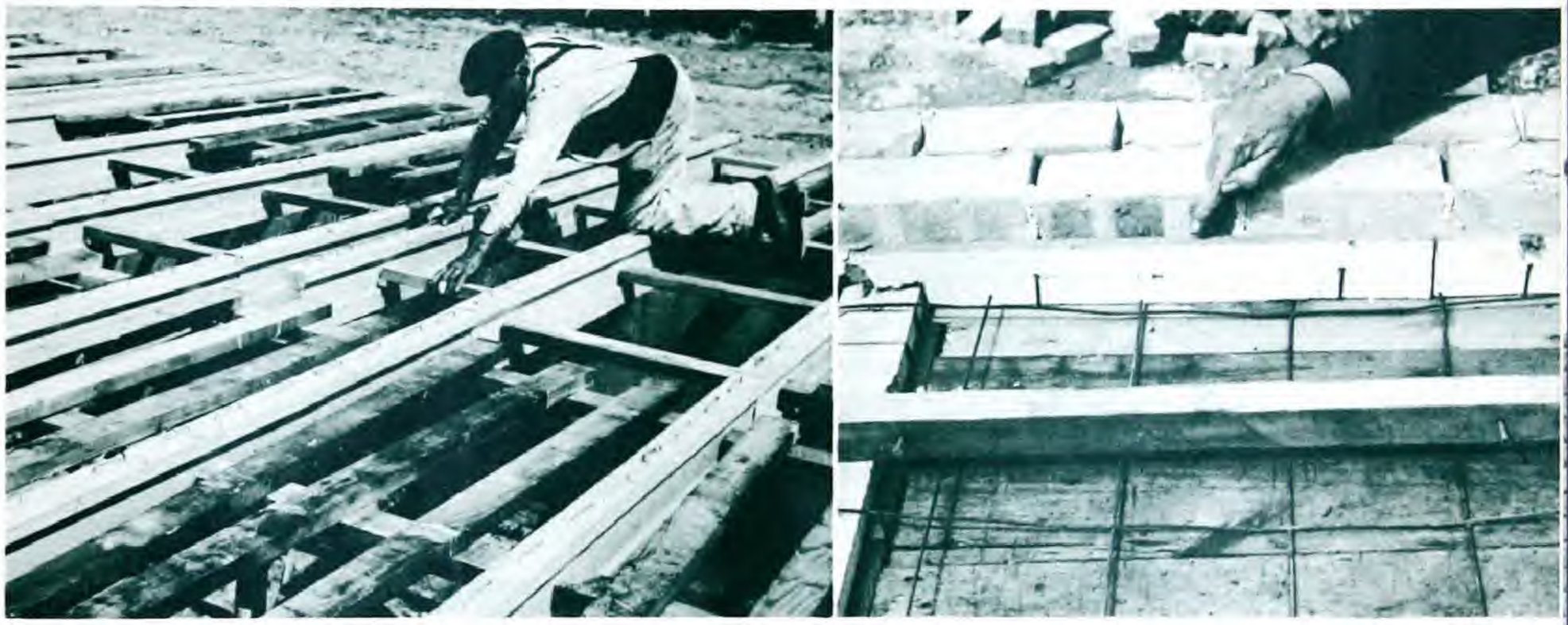
These floors are made of precast concrete joists and a job-placed concrete slab over the top of the joists. The precast concrete joists are made in a plant and delivered to the building site ready to be used. For farmhouse floors of average spans 8-in. high joists are used. Joists are also made in 10- and 12-in. heights for floors where span and loading conditions require their use. Concrete joists are reinforced with steel to give them strength adequate to withstand the various stresses imposed upon them.

The concrete slab placed over the joists is usually 2½ in. thick. It is placed in such a manner that it embraces the heads of the joists to a depth of about ½ in. so that floor slab and concrete joists act together in carrying loads.

Precast concrete joists are set in much the same way as wood joists. Steel hangers are sometimes used to support joists around stair wells and other large openings through the floor where one joist abutts against another.

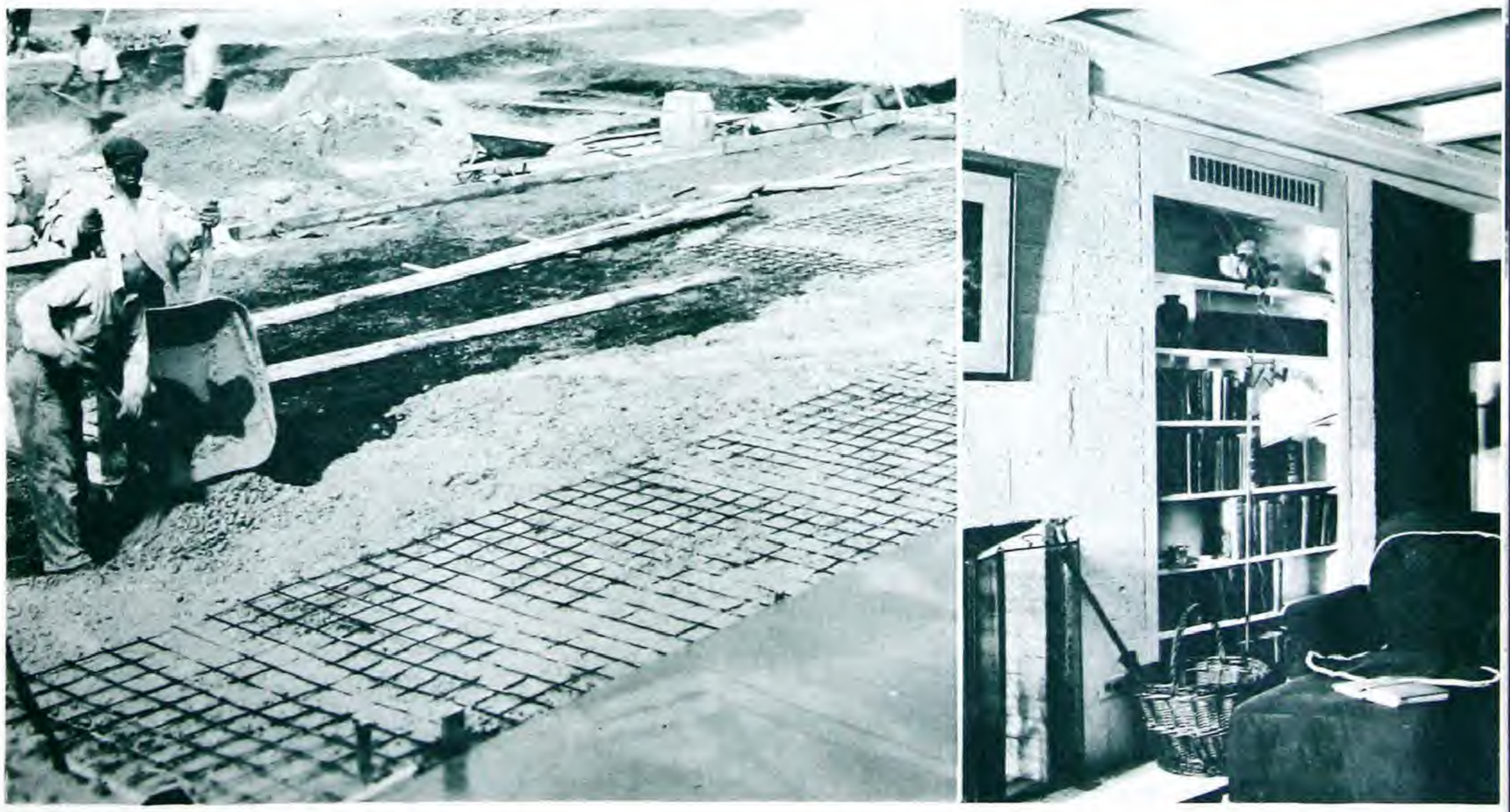
Left—On this job the precast joists have all been set and the forms are being built for the concrete slab to be cast over the joists.

Right—Where the floor slab abutts against an outside wall a strip of insulation is placed to prevent heat loss.



Left—After forms are completed and reinforcement is in place a 2½-in. thick concrete slab is cast over the joists.

Right—A beamed ceiling effect is obtained by leaving the underside of a precast concrete joist floor exposed. For a plastered ceiling the plaster base can be attached to the bottom of the joists.



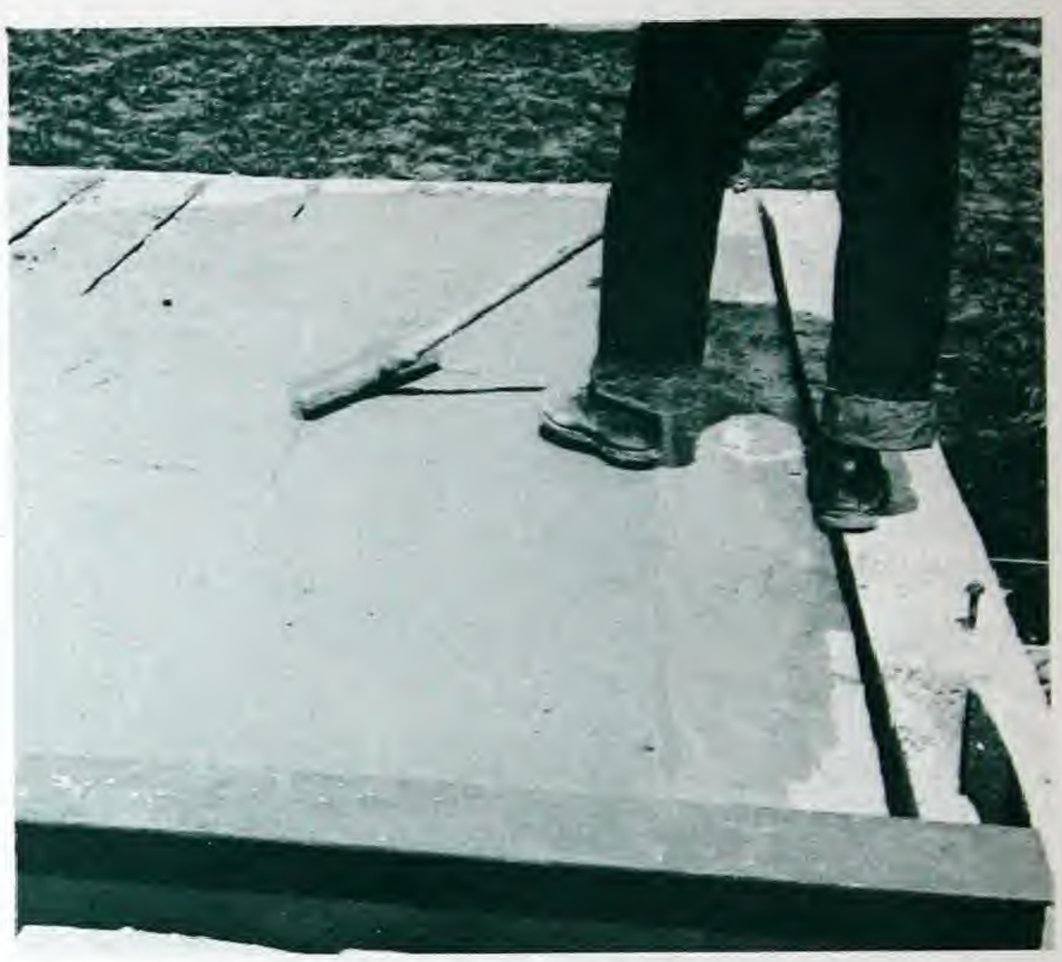
If you were to visit the construction of a precast concrete joist type of floor, whether for the first or second story, you would note that the walls of the house had already been completed to the height at which the floor was being built. You would observe concrete joists being delivered to the job and set in position on the walls in much the same manner as wood joists, except that the spacing between the joists would be wider. Spacings from 27 to 33 in. are quite common. You would note that the forms for the concrete slab were hung onto the concrete joists and that there was a relatively small number of supporting members or shoring under the joists, except perhaps near the midspan. Form sheathing, the platform on which the concrete slab is placed, would be made of boards laid closely together or of sheets of plywood or metal. As with other types of floors you would see reinforcing bars or mesh being placed, screeds being set for controlling floor thickness and connections for utilities being installed prior to placing the concrete mixture for the floor slab. The placing of the concrete mixture, leveling it off, wood floating, finishing and curing would be like that for flat slab concrete floors. See pages 19 and 20.

In constructing precast concrete joist floors over basements it is common practice to leave the lower side of the joists uncovered or "exposed", as builders often term it.

Joists are frequently left exposed in second floors to achieve a beamed ceiling effect. They can be painted or stenciled to blend with the decorative treatment of the room. Where plastered ceilings are desired, wood or metal strips are attached to the bottom edges of the joists and metal lath or other plaster base is fastened to the strips.

How to Design and Build Precast Joist Concrete Floors is the title of a Portland Cement Association booklet which will be helpful to designing engineers. Copies are available free on request.

A special rubber-tired rig is used to set the precast units in place. It doesn't take long to cover a floor with these big concrete units.



Grout is worked into specially designed joints between precast units. The edges on the bottom side fit tightly together.

The underside of the floor can be left exposed and painted. Plaster can be applied if a plastered ceiling is desired.

Precast Concrete Unit Floors

Several types of precast concrete unit floors have been developed. Builders will usually know which types are available locally. Design and construction information is usually furnished to builders by manufacturers. Precast unit floors consist of precast structural members made in a plant for the particular floor in which they are to be used. They are made a length equal to the floor span between supports. Thickness of floor units and reinforcement are designed according to loads to be carried. Widths of units are usually 12 in. or less. They are set side by side over the area to be floored. Special provision is usually made for joining and bonding the units together.

CONSTRUCTING WARM, DRY CONCRETE FLOORS ON GROUND

A typical floor on ground construction view. Plumbing connections are in place. The "troughs" crossing the floor are return ducts for the heating system to be installed in this house.

One of the first steps in building a warm, dry floor on ground is to place 6-in. fill of slag, gravel or crushed rock over the subgrade. The fill is leveled off and compacted by tamping.

Two layers of 15-lb. roofing felt or waterproofed fabric turned up 4 in. at the wall make up a moisture barrier. Here the first strip of the first layer has been laid and the edge covered with asphalt which seals the strips together.

The first layer of strips is being mopped with asphalt. The second layer will be laid crosswise to the first and mopped with asphalt.

A vaporproof insulation strip 1 in. thick and 4 in. wide is set against the outside walls before the concrete is placed. This insulates the floor from the wall and helps produce a warm floor.

IN recent years there has been a large increase in the number of concrete floors placed on ground. They have become increasingly popular for use in that part of the house under which there is no basement, and they are suitable without other floor covering for washrooms, utility rooms and recreation rooms. In areas where it is customary to build houses without basements, a concrete first floor placed on ground provides a satisfactory, economical, long-life type of construction. Properly built, such floors will be dry and warm. Any desired type of floor covering—hardwood, carpet, tile, linoleum, etc.—can be applied over such floors, in which case they serve as concrete subfloors. The recommended practices for applying various coverings over such floors are given on pages 17 and 18.

It is recommended that the following steps be taken in constructing concrete floors on ground:

A first requirement is that there be a fill placed under the floor. This fill should be of coarse gravel, crushed stone or slag at least 6 in. thick over the entire area to be floored. Ordinary aggregate is run over a screen to take out material smaller than 1 in. in size. This fine material is not good for dry fill. The fill is leveled off and tamped until firm; it should bring the finished concrete floor well above the surrounding grade. Care is taken not to break or puncture the felt in working over it. Builders place a thin layer of stiff cement grout over the fill a few days before putting down the waterproof felt in order to provide a smooth puncture-proof surface. When this grout coat is dry it is mopped with hot asphalt. If the building site does not have good natural drainage, tile lines are put in to assure drainage.

Over the grout coat are placed two layers of 15-lb. roofing felt or other waterproof fabric. Strips of this material are lapped and sealed with asphalt. The strips are turned up 4 in. against the wall to make a watertight seal between floor and wall. When the first layer of strips is laid, it is mopped thoroughly with hot asphalt. The second layer of strips, also sealed with asphalt, is laid at right angles to the first layer; ends are turned up 4 in. against the wall. When laid, the second layer of waterproofing felt is mopped all over with asphalt.

Around the edge of the floor where it abutts against exterior walls a strip of vaporproof insulation about 1 in. thick and 4 in. wide is placed. This insulation prevents heat loss around the edge of the floor and is very important in constructing warm, dry floors.

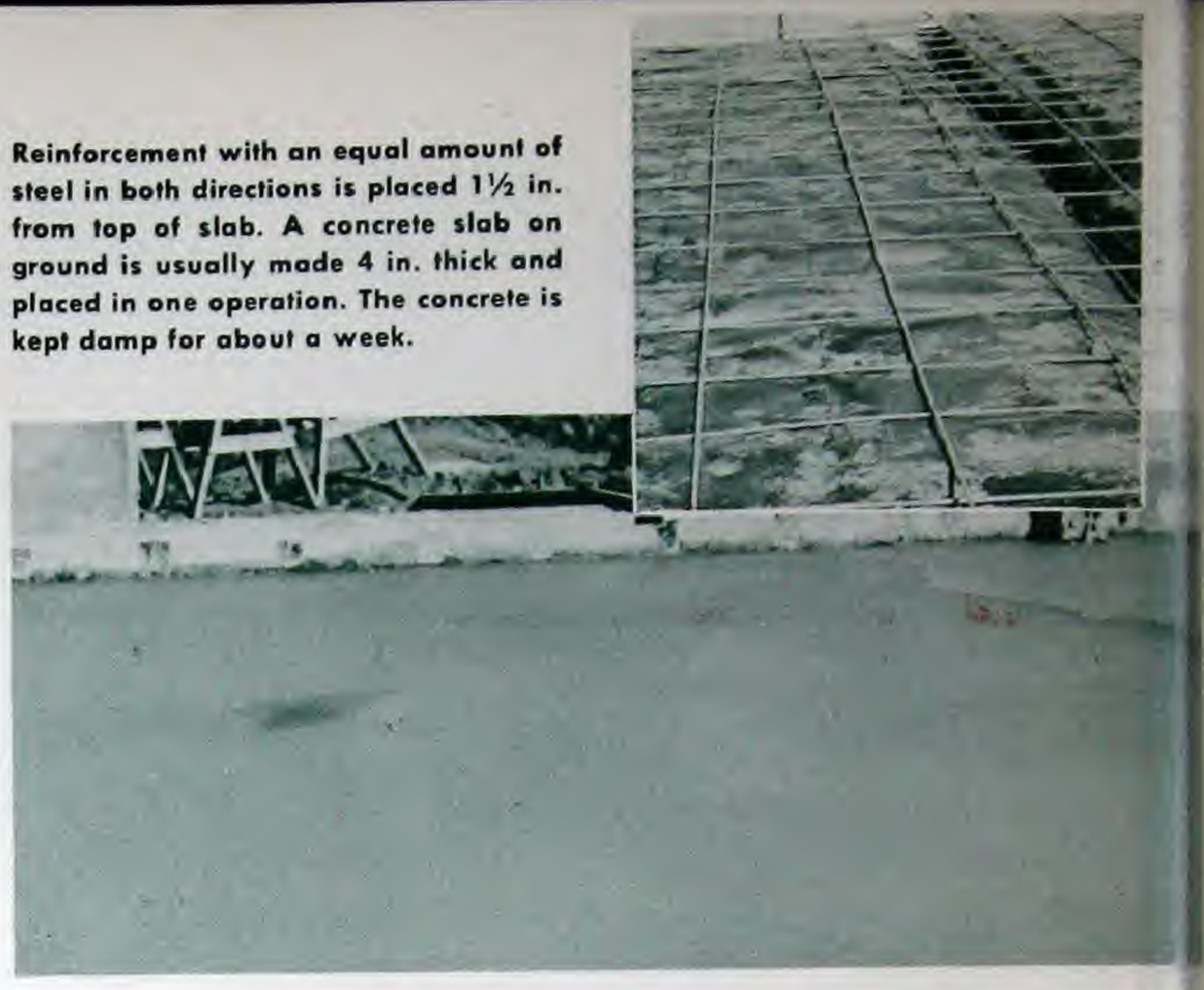
The concrete slab is usually made 4 in. thick, and the mixture would be proportioned according to Table 2 on page 39. For correct amount of mixing water see suggested proportions on page 13.

The entire floor is placed in one continuous operation, and the same mixture is used throughout. It is leveled off, wood floated and cured the same as flat slab concrete floors (see pages 19 and 20).

Metal reinforcement weighing not less than 40 lb. per 100 sq.ft. with cross-sectional area of the reinforcement equal in both directions is placed in the concrete slab 1½ in. from the top surface.

For further information write Canada Cement Company Limited for copy of *Concrete Floors on Ground — for Residential Construction*, sent free on request.

Reinforcement with an equal amount of steel in both directions is placed 1½ in. from top of slab. A concrete slab on ground is usually made 4 in. thick and placed in one operation. The concrete is kept damp for about a week.



FOOTINGS AND FOUNDATIONS

EVERY well-designed house is planned from *below* the ground up. In fable, Scripture, and verse man has been warned to build his house on a firm foundation.

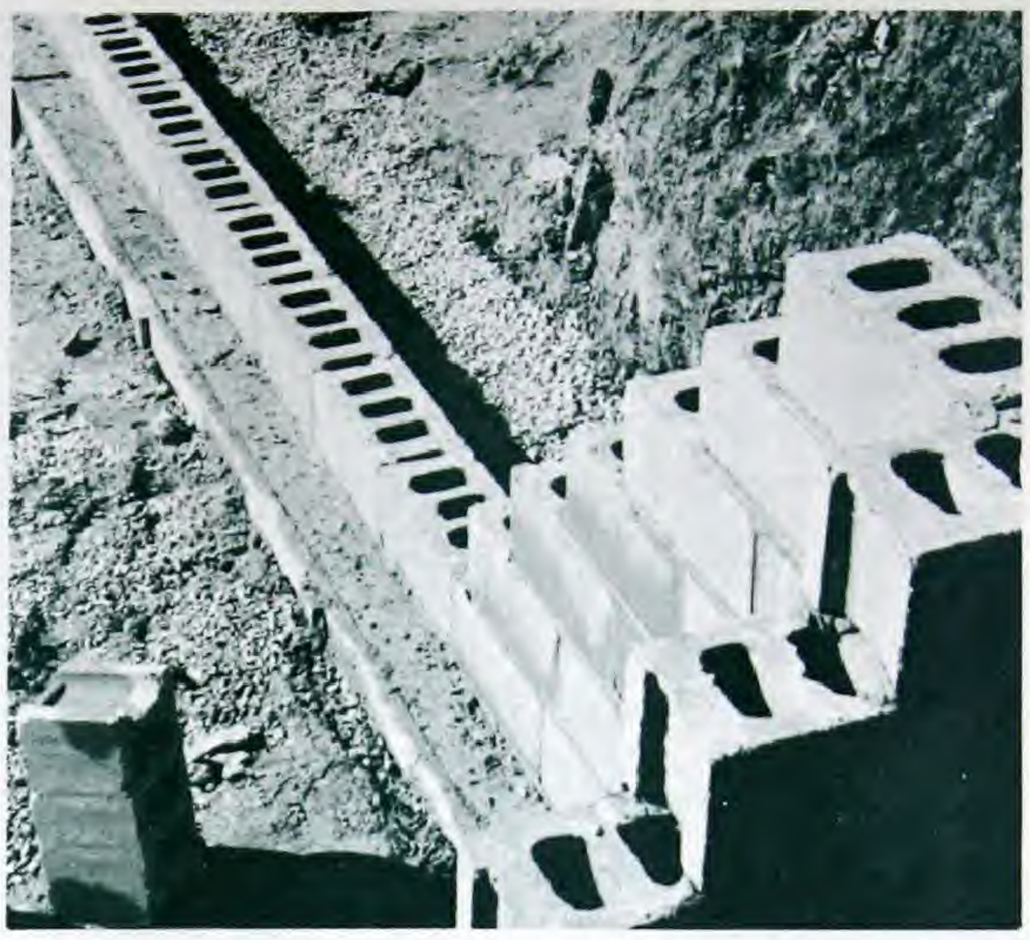
A substantially built house is a relatively heavy structure. To make sure it will stand square without settlement it should be supported on concrete footings having proper width or spread. Your local contractor knows from experience the importance of adequate footings. He knows also that some soils will carry much greater loads than others. For example, gravel will carry as much as six tons on each square foot; hard, dry, clay soil will sustain four tons per square foot; soft clay soil will carry not more than one ton per square foot. The builder takes both type of soil and weight of the building into consideration when designing footings.

For average load conditions on average soil, footings are usually made at least 16 in. wide for 1- and 1½-

A typical concrete footing. Side forms will be removed when concrete hardens.

Footings for interior load-bearing walls are usually made the same width and thickness as footings under exterior walls.

Footings for posts and columns should be large enough to carry the load without settlement. Frequently they are made too small.



Beginning the construction of a concrete masonry basement wall.

story houses, and 24 in. wide for 2-story houses. Usual practice is to make footings one-half as thick as they are wide or 8 in. thick for 16-in. footings and 12 in. thick for 24-in. footings.

Another requisite of a good footing is that it be flat across the bottom so that the building it supports will stand firm and square. Rounded footings are to be avoided.

Since surface soil ordinarily does not have good load-bearing properties it is the usual practice to excavate to firm soil. In areas where freezing of the soil occurs, the footing is carried down below frost penetration to prevent freezing from taking place under the footing. This might cause the walls to heave and produce cracking in some part of the structure. Experienced builders know the proper depth to go in their localities to make footings safe against frost upheaval.

Footings for Interior Walls, Posts and Chimneys

Footings for interior load-bearing walls, for chimneys and for posts and columns must also be designed to provide adequate spread to carry the load without settlement. Footings for interior bearing walls are usually made the same width and thickness as for exterior walls. Post and column footings frequently are made too small. The resulting settlement causes sloping floors, diagonal cracks in plaster of partition walls, and ill-fitting doors. For average conditions, footings under interior posts should be from 2½ to 3 ft. square and 1 ft. thick.

Special care is taken in constructing footings under chimneys because any cracking in chimneys resulting from inadequate footings may create a serious fire hazard. Experienced builders will usually make such footings 12 in. thick and large enough to project 6 in. beyond the chimney base on all sides.

The recommended mixture for concrete footings is given in Table 2 on page 31. This same mixture is used for foundation walls which need not be watertight.

Foundation walls above the footing may be either cast-in-place concrete or concrete masonry. Often the foundation wall serves as the basement wall for a house; in this case, special precautions are taken to secure a dry wall. Recommended procedure in constructing watertight basement walls is given on page 26.

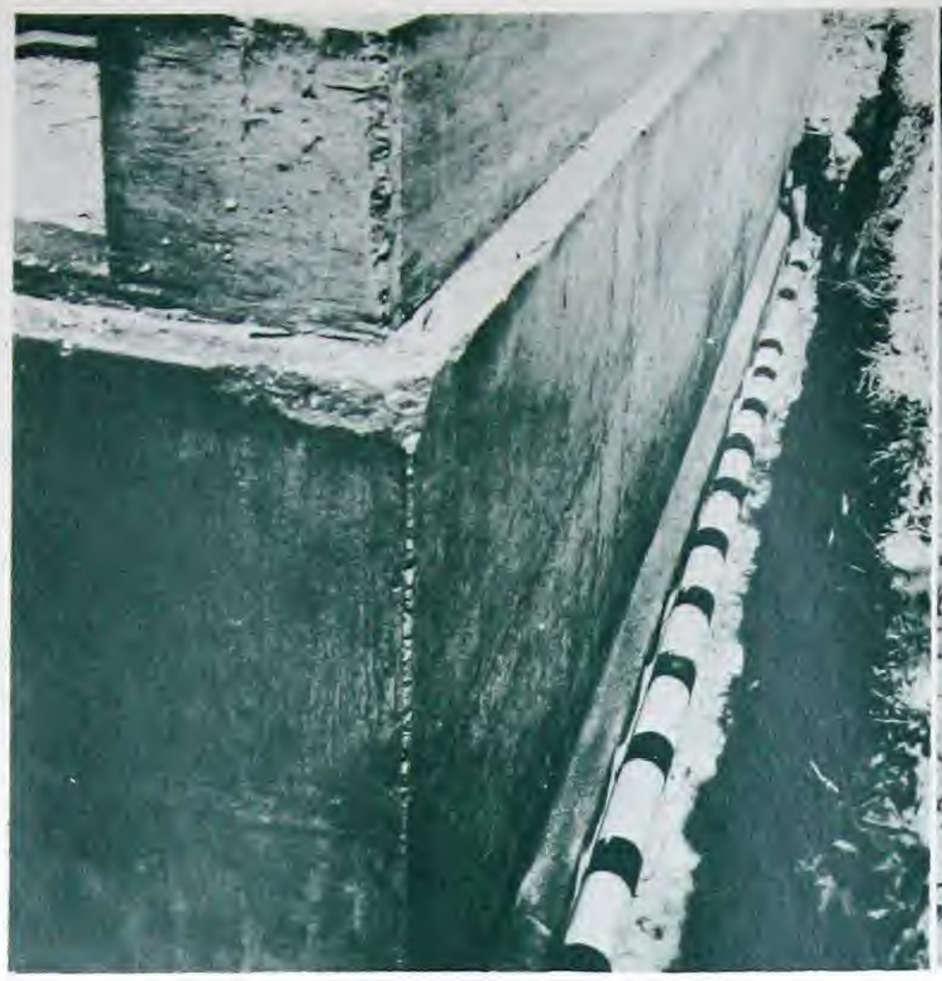
BUILDING A DRY BASEMENT

It costs much less to build a watertight basement in the first place than to repair a leaky one later.

The construction of watertight basement walls and floors is not difficult. The following construction practices are recommended.

Drainage Around Footing

Drainage around the footing is strongly recommended in all localities where there is likely to be water in the soil. Usual practice is to place a line of 4- or 5-in. drain tile entirely around the building just outside the footing. It is connected to a suitable outlet and laid with a fall of at least 1 in. in 25 ft. to insure rapid runoff. The line of tile is covered with crushed rock, gravel or coarse cinders to a depth of 12 to 18 in.



Constructing Watertight Walls

Construction of cast-in-place concrete basement walls should follow the recommended procedure given on pages 11 to 13. A coating of hot asphalt or other bituminous material is frequently applied to the earth side of the wall below grade as an additional waterproofing measure.

Basement walls of concrete masonry are built with the same care as above grade walls as outlined on pages 9 to 11. In addition, they are given two coats of portland cement plaster on that part of the exterior wall that will be underground. Each coat is about ¼ in. thick. Plaster is of the same mixture as mortar for laying the block. Plaster is carried down onto the footing and rounded off for good drainage. An asphalt coating is often applied over the plaster as further protection against possible leakage.

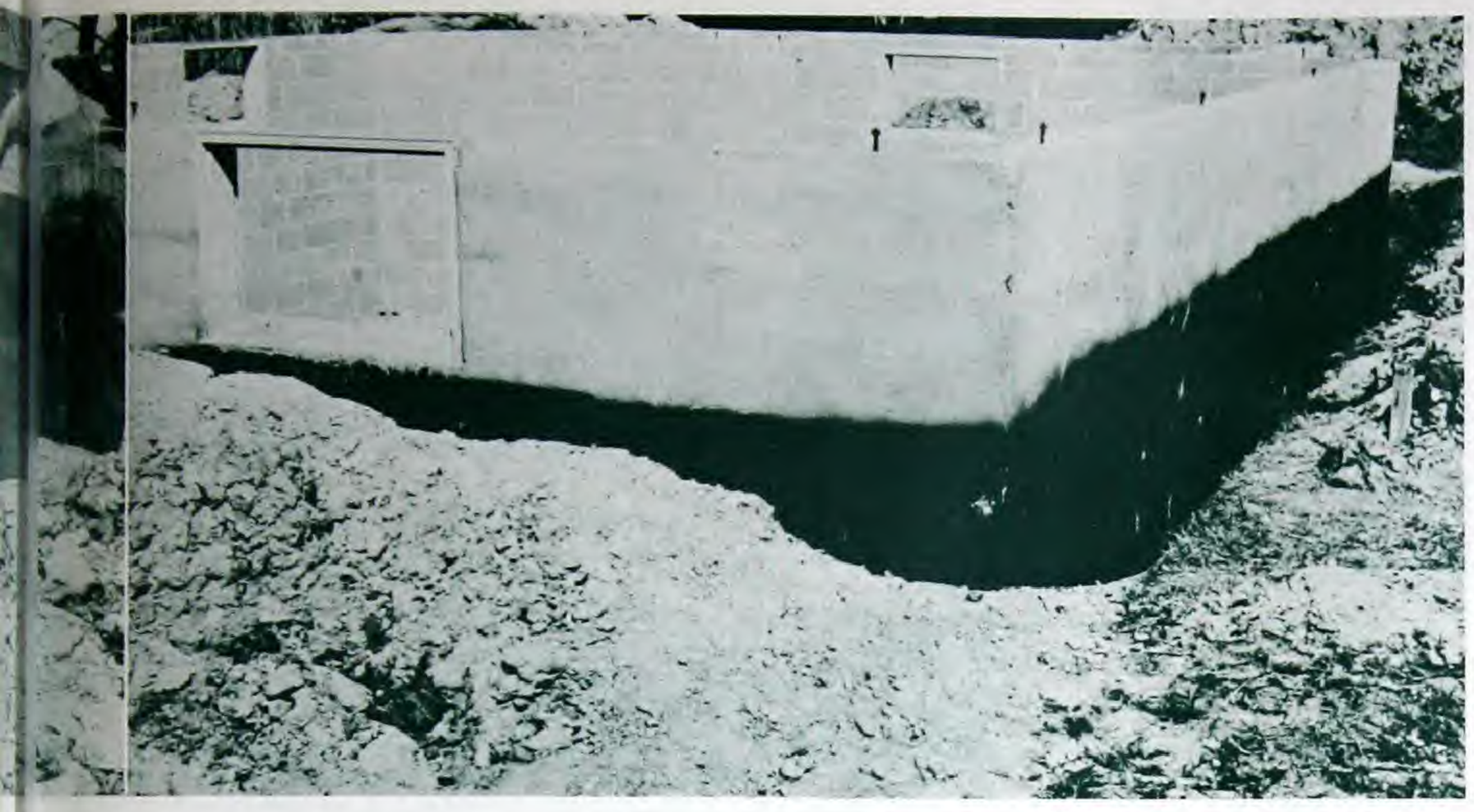
Let us repeat, it's far cheaper to build a watertight basement in the first place than to repair a leaky one later.

Drawing illustrates recommended method of constructing watertight basement walls. The drain tile is laid even with the bottom of the footing and is covered with gravel, crushed stone or coarse cinders. The outside surface of the wall has been given two coats of portland cement plaster and then mopped with asphalt. The arrow points to the tar or asphalt joint where the wall and basement floor come together.

Backfilling

Backfilling is important in building watertight basement walls. However, filling-in should be postponed until after the floor over the basement is completed. The floor gives the wall added strength to withstand pressure resulting from the fill. Backfilling is made so that much of the rainwater will drain away from the house rather than soak into the fill and so that any water which soaks into the fill will be quickly carried away through the drain tile.

The recommended practice is to make the fill in three layers. The first or bottom layer is of some porous material which permits water to reach the drain tile quickly. The second layer consists of well-compacted clay or other soil from the excavation which is filled in to within a few inches of the finished grade. The third or top layer is made with soil in which grass will grow. The completed backfill should have enough slope away



1. A line of 4-in. drain tile for carrying away groundwater is placed entirely around the outside of the footing and sloped toward a suitable outlet. The joints of the tile are covered with pieces of roofing felt. 2. Concrete masonry basement walls are made more watertight by applying two coats of portland cement plaster to the outside surface below grade. 3. An asphalt coating often is applied over the portland cement plaster for added protection against leakage. The asphalt is applied only up to ground level.

from the house to insure quick drainage of surface water. Downspouts should be connected to underground drains or arranged to discharge water some distance from the wall.

Watertight Wall-Floor Joint

A frequent source of leakage is the joint between the concrete basement floor and the basement walls. A tar or asphalt joint at this juncture will usually prevent leakage. This joint is made by pouring hot tar or asphalt in a space about 1 in. wide between the floor and the wall. The opening for this joint can be made by placing three strips of beveled siding against the outside wall before the concrete floor is placed. After the concrete has hardened the strips are removed and the opening is poured full of tar or asphalt. (See illustration at right.)

Dry Basement Floors

The basement floor is usually 4 in. thick and is of one-course construction with the same mixture of concrete throughout. In cases where there may be pressure from ground water or other causes, this thickness is increased and the slab reinforced and anchored to the walls or footing to meet the additional pressure. As a further precaution, under extreme groundwater conditions, the floor is placed in two layers with membrane

The space for the joint between the basement wall and floor is made with three pieces of beveled siding set against the wall before the floor is placed. The two outside pieces are set with the thick edge down and the middle piece with the thick edge up. After concrete hardens the siding is removed by lifting the middle piece first and then the outside pieces. Hot asphalt is poured in the space, making a watertight joint.

A clean, dry basement with concrete walls and floor is an ideal place for the heating system and hot water tank.

A properly built watertight basement makes an excellent place for a recreation room or a workshop.

waterproofing between. For recommended concrete mixture see Table 2 on page 39.

Dampness Due to Condensation

Dampness in basements is frequently caused by condensation of moisture, or "sweating" as it is often called, on the walls or floor rather than by water coming through them from the outside. This condition is most likely to occur in summer when humidity is high. The causes of condensation and the conditions under which it occurs are discussed on pages 15 and 16.

When condensation is the cause of dampness in basements the most common corrective measure is to insulate the inside surface of the outside wall. This can be done by applying plaster on metal lath furred out from the wall to provide an air space between the plaster and the wall. Vapor-sealed rigid insulation or wallboard may be used as the plaster base or may be used without a plaster covering. Other steps taken to keep walls free from condensation are to extract moisture from air by chemicals or to heat and dry the air in the basement. Often the relatively small amount of heat thrown off into the basement by a water heater will prove quite effective in keeping a basement dry.

FIRESAFE ROOFS

Durable Cement Asbestos Shingles

Sparks landing on combustible roofs cause about 30 per cent of country house fires. A roof covered with firesafe cement asbestos shingles protects your house from destruction by fires from this source.

In manufacturing cement asbestos shingles, asbestos fibers are combined with portland cement paste and molded under terrific pressure, producing shingles that are durable and firesafe. They are manufactured in several different sizes and shapes and in an assortment of colors and textures. Manufacturer's directions, available at dealers, are followed by builders in laying cement asbestos shingles.

Flat Roofs

In building flat roofs, builders follow the same general principles of design and construction as for supported reinforced concrete floors discussed on pages 19 to 22. Concrete roof slabs are carefully insulated by placing over them insulation—usually in the form of vapor-sealed, rigid board insulation at least 1 in. thick. Then a built-up roofing is put on in accordance with manufacturer's directions to make the roof weather-

tight. Special care must be taken to provide adequate flashing around chimneys and against parapet walls. In general it is recommended that houses with flat roofs be built without parapet walls in order to avoid possible leakage where roof slab and parapet walls meet.

STAIRWAYS

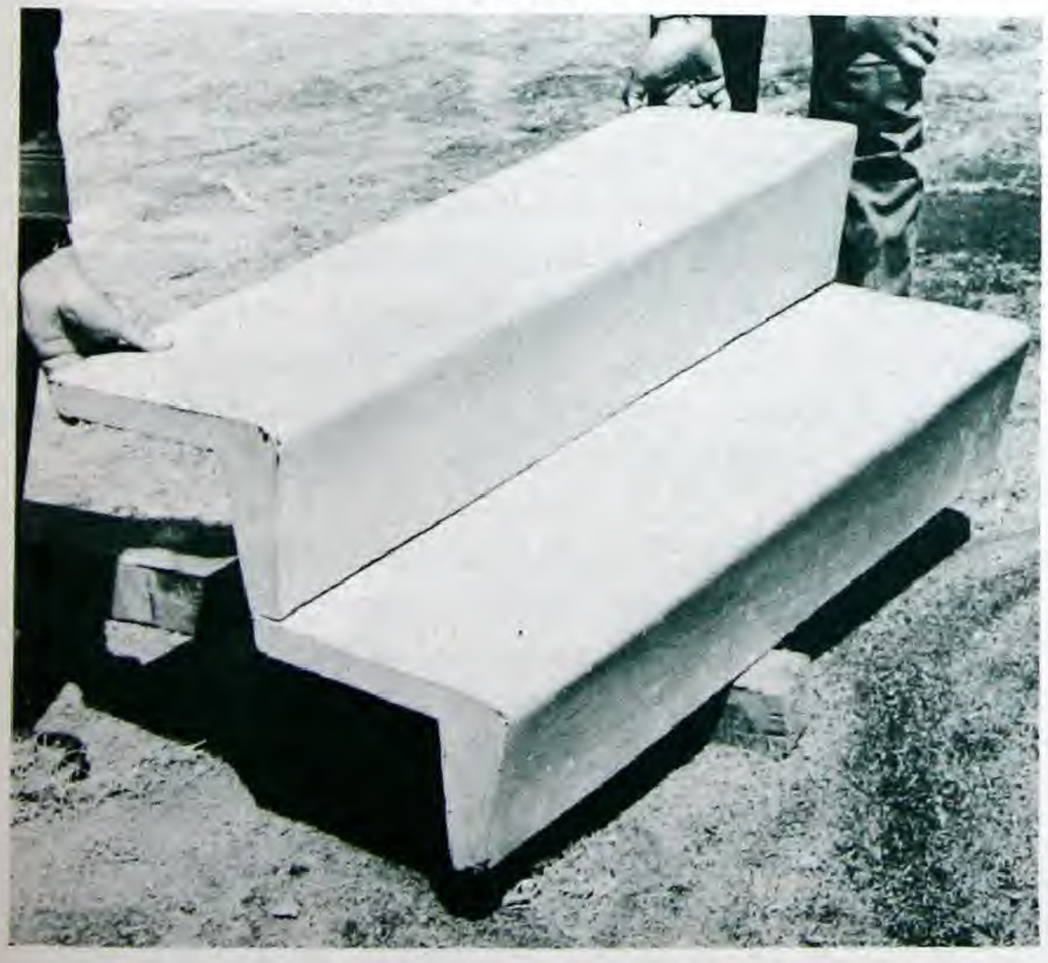
In a modern farm home, stairs are as much a planned part of the house as floors and walls. Tragedy often strikes in a home because stairs are of combustible construction. Such stairs act as flame feeders from one floor to another, cutting off possible escape of occupants on upper floors. Concrete stairs, on the other hand, provide safe exit in case of fire. Moreover, they are durable and give added rigidity to the house.

Concrete stairs are usually of two types—those which consist of precast concrete units and those which are cast-in-place on the job. Precast concrete stairs are made in a products plant. Each precast stair unit usually consists of a tread and a riser and is made in lengths equal to the width of the stairway in which it is to be used.

Cast-in-place concrete stairs are usually designed to fit the particular house for which they are built. A competent structural engineer should design and supervise their construction.

Both types of concrete stairs are satisfactory. They can be used with or without conventional stair carpets or other coverings. Precast concrete stairs are often given a ground finish to expose special colored aggregate used in their manufacture. This terrazzo-like surface is attractive and durable.

Typical precast concrete steps.



MODERNIZE THE FARM AND SUBURBAN HOUSE

Many fine old farm and suburban homes are solidly built and structurally sound, but suffer from common ailments of age. They lack many features and conveniences of modern farm and suburban homes. Space is inadequate and rooms are poorly arranged. Walls, roofs, foundations and porches show the effects of the beating they have taken from the weather. Often the owners of these sturdy old houses attach sentimental value to them. For these and other good reasons many farm and suburban homes will be remodeled or modernized; others will have additions built on.

Many of these old homes do not have basements or have basements under only part of the house. Some of these basements have dirt floors and are not walled up to meet presentday standards. Some have cramped ceiling space, which makes it desirable to raise the house. The obvious solution is a concrete floor and concrete basement walls. The construction of basement walls and floors, as described for new houses on pages 25 to 28, applies to modernizing jobs.

Where new additions are built onto old farm and suburban homes, the construction practice for walls, floors and roofs as described in preceding pages of this booklet is recommended.

Many old farm and suburban homes have had several

A stairway made of precast steps.

Putting a concrete masonry basement wall under an old house. Jacks and timbers are used to hold up the house while the work is carried on.

A new durable, cement-asbestos roof and new concrete masonry basement walls add years of service to this farm home.

Cement asbestos siding gives this old house a lasting, dressed-up appearance.

Decay and termites will never bother this new concrete slab porch floor.

roof coverings applied, one above the other, yet the roof leaks and appears badly patched up. For these roofs a covering of firesafe cement asbestos shingles is suggested.

The walls of an old house, if of frame construction, can be rejuvenated with a covering of cement asbestos siding or portland cement stucco. Cement asbestos siding is available at most building material dealers, who can furnish instructions for its proper application. Stucco should always be applied by contractors having experience in that kind of work.

PLANNING YOUR HOME

ANY kind of house you want can be easily built of concrete. It can be either a one-story or two-story house, a cottage or a mansion, and in any desired architectural style, conventional or modern.

Perhaps you already have house plans which you have clipped from farm and home magazines. Or perhaps you have worked up a plan yourself. House plans designed for any construction material can be adapted easily to concrete. On the following pages, you will find many valuable suggestions on how to plan a home for maximum comfort and convenience. For this reason, the Canada Cement Company Limited has not found it practicable to prepare and offer detailed plans for concrete suburban and farm homes. Some agricultural colleges have a planning service which gives attention to individual problems of the rural home owner who is planning to build a new home or repair his old one. Your home demonstration agent and county agricultural agent often can give you similar assistance.

Housing requirements are different for various regions of the country and it is therefore wise to use plans especially adaptable to your region. However, we feel sure that the floor plans shown on the following pages can be adapted to meet conditions existing in any area of Canada. For further information on the subject of home construction, write for our booklet entitled "Your Concrete Home" which includes a number of floor plans suitable for urban and suburban homes. Our 16-page pamphlet "Building With Concrete Masonry", the "Plasterer's Manual", and our information sheet "Portland Cement Base Paint" are also available, free of charge, on request.

Concrete products manufacturers who serve your community will be glad to give you the names of reliable architects and builders experienced in the design and construction of concrete homes. They can also supply you with up-to-date information on concrete house construction and the type of concrete building units available from their plants. Your local builder also can give you construction information.

SUGGESTED PLANS FOR COUNTRY AND FARM HOMES

1-STORY WITH FLOOR PLAN FOR NORTH OR SOUTH

3 bedrooms—living room—kitchen workroom or basement (expandable from one to three bedrooms)

1 —with workroom for South

2 —with basement for North

Designed so that basic unit may be built with one bedroom first and two bedrooms added later

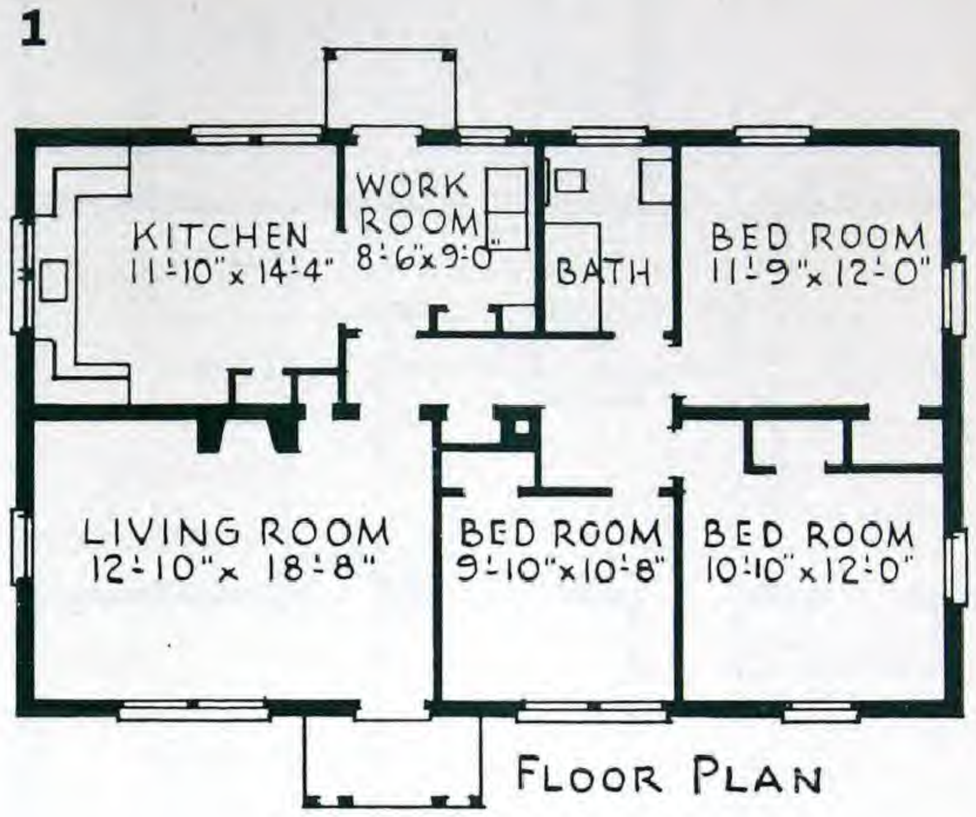
Concrete floor on ground (1) or with a full basement (2) .

Large kitchen with dining space

Built-in kitchen cabinets

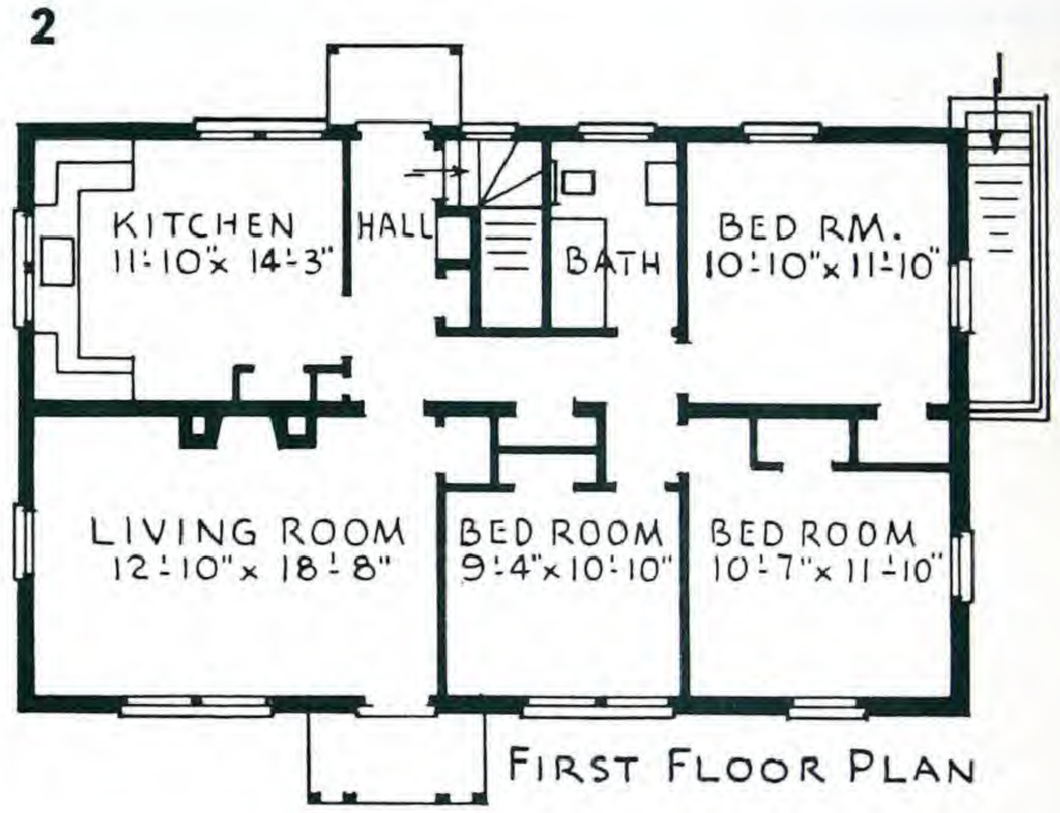
Economical rectangular shape

1

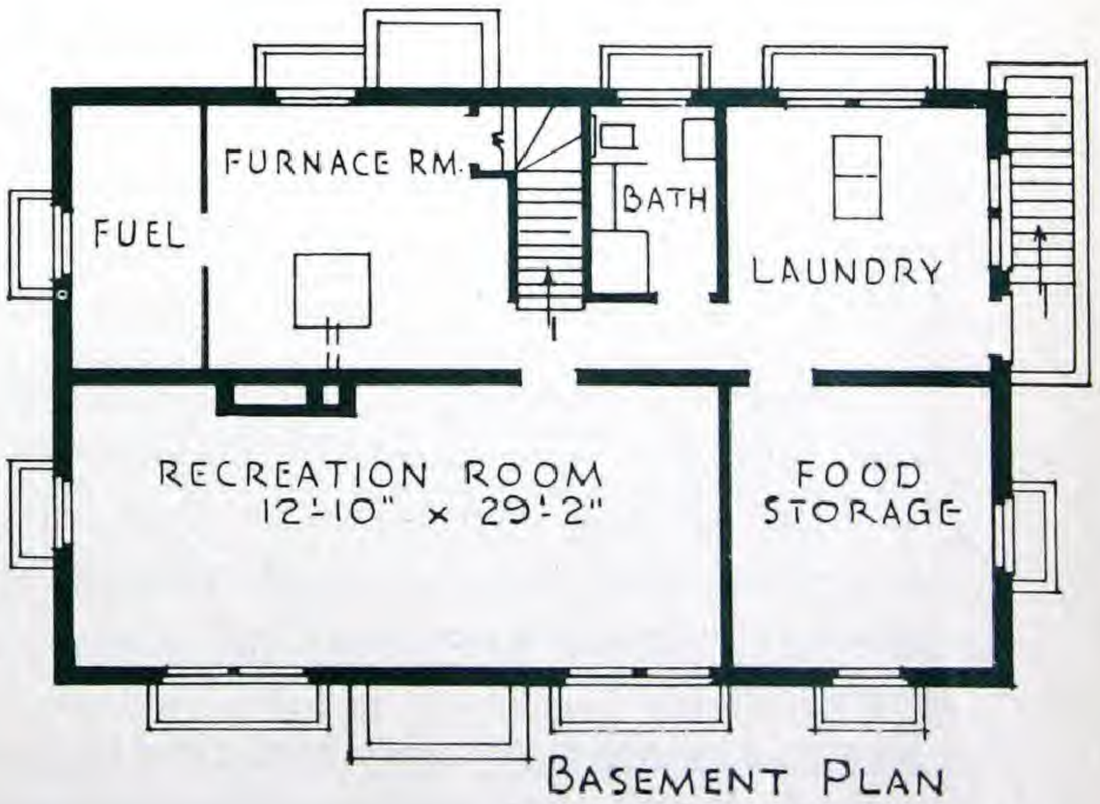


FLOOR PLAN

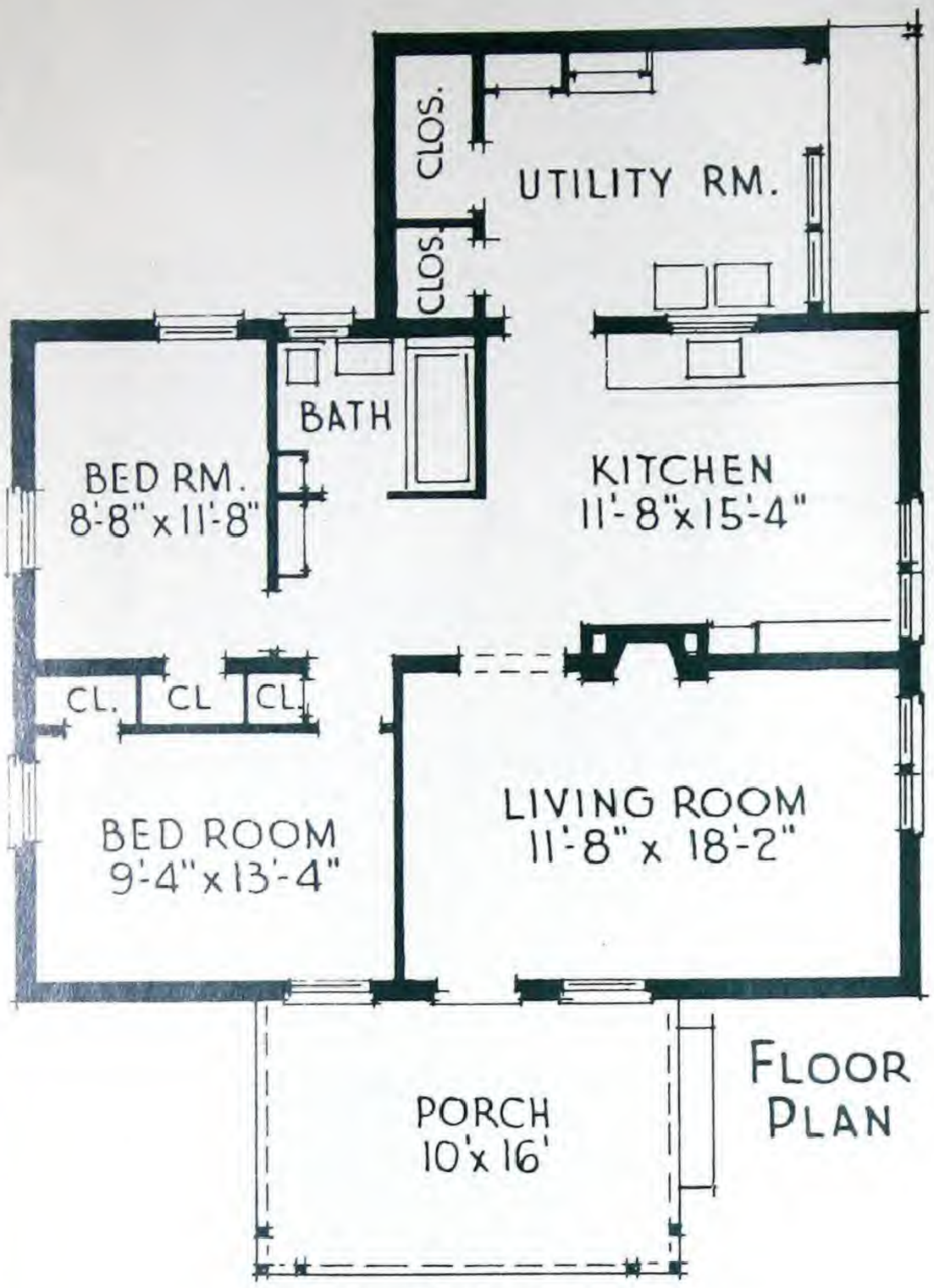
2



FIRST FLOOR PLAN



BASEMENT PLAN



FLOOR PLAN

1-STORY HOMES FO

2 bedrooms—living room
kitchen—utility room

★Large kitchen with dining space

★Utility room

★Large front porch

★Concrete floor on the ground

★Central hall connecting bedroom and bath

Concrete masonry homes

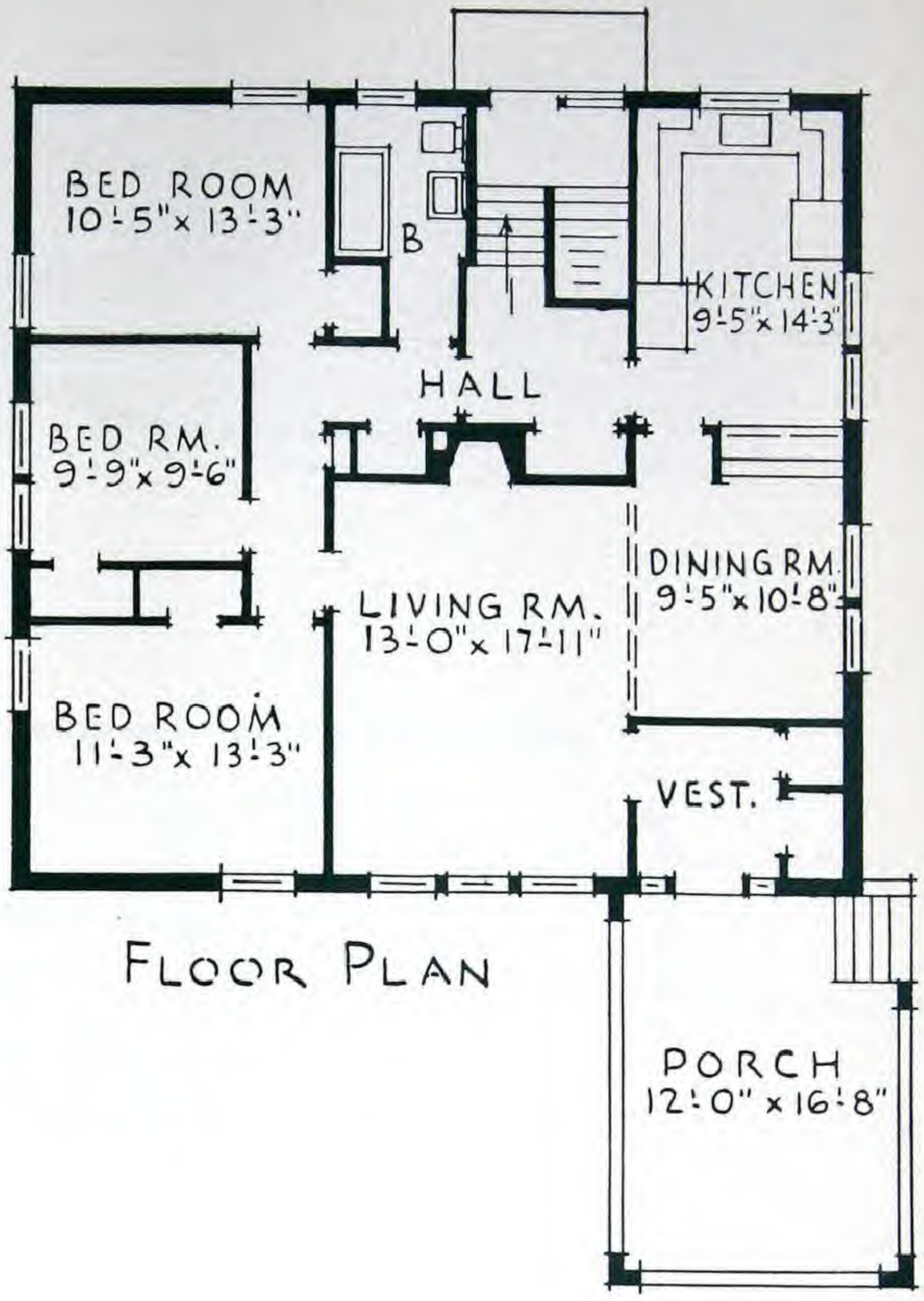
Concrete homes resist elements that weaken and eventually destroy less durable homes. They stand secure against fire, rust, rot, vermin and storm.

Firesafety

Firesafety is desirable in any construction. In farm buildings it is essential. Dependence on rural fire-fighting equipment for protection of family and home may be a costly gamble where distances from town are great and equipment is not complete.

Every day lives are lost and farm property valued at one-quarter of a million dollars goes up in flames, with faulty construction as a major cause of loss. Concrete homes constructed according to recommendations in this booklet will be firesafe.

This staunch little concrete home gives the farm family added security against storm and fire.



FLOOR PLAN

OR LARGE OR SMALL FAMILIES

3 bedrooms—dining room
living room—kitchen—basement

- ★ Handy "U" shaped kitchen
- ★ Central hall to back door
- ★ Full basement with laundry, food storage and wash room
- ★ Large porch
- ★ Firesafe concrete floor

e provide DURABILITY

Fires originating in the basement may go unnoticed until they have developed beyond control. A concrete first floor provides an effective fire stop.

Vermin Control

Rats eat or destroy 40 million dollars worth of farm property each year—an expensive meal of food, floors and walls.

The best practical safeguard against these pests is to build with concrete. Foundations, floors and walls of concrete protect the family's home investment from the rats' destructive work. Vermin cannot eat concrete.

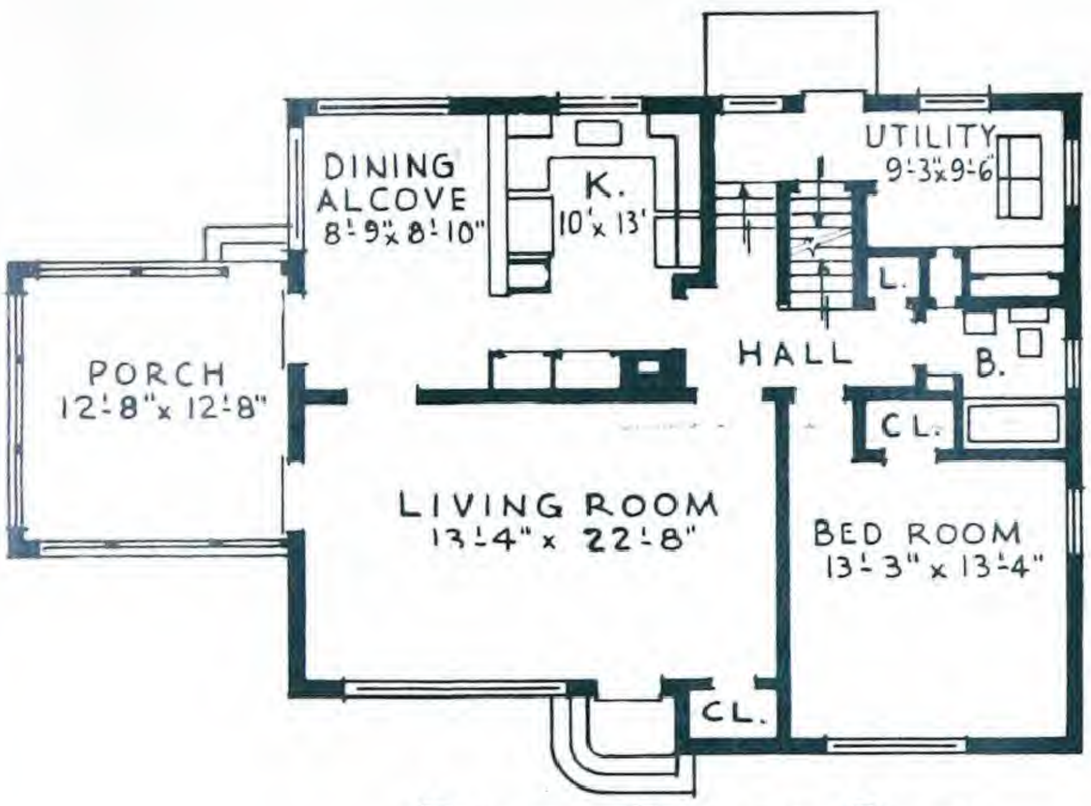
Concrete floors on ground eliminate the damp, dark crawl space under basementless homes which furnishes a breeding place for termites and other pests.

Concrete is Sturdy

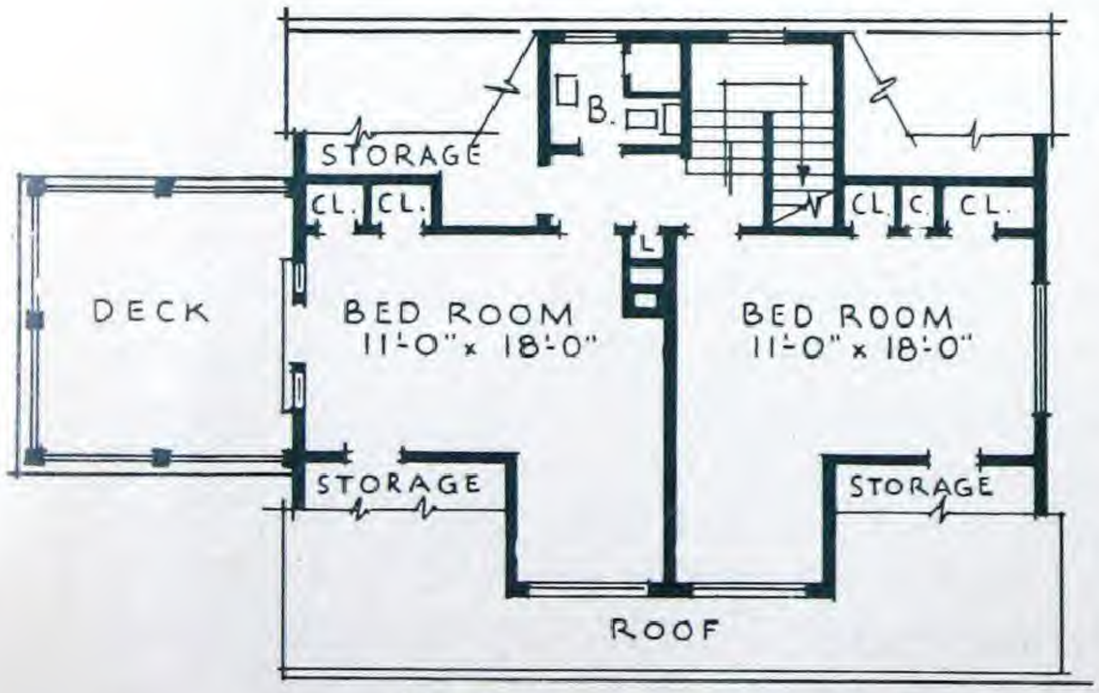
Concrete homes withstand years of weathering without losing their pleasing appearance. Their stability begins at the footing. Generally concrete footings are made twice as wide as the wall is thick. High-quality concrete block tightly bonded with portland cement mortar form strong foundation and above-grade walls. Loads over window openings are carried by reinforced concrete beams or lintels. Special jamb block are used at sides of doors and windows. These fit tightly against door and window frames to keep out wind and rain.

1½-STORY HOME

3 bedrooms — utility room — kitchen
dining alcove — living room — basement



FIRST FLOOR PLAN



SECOND FLOOR PLAN

★ First floor bedroom

★ Central hall connecting all first floor rooms with back door

★ Bath on both floors; shower in basement

★ Screened side porch

★ Picture window in living room

★ Concrete first and second floors

★ Large basement for food storage and furnace room

Concrete gives high quality

AT

Forward-looking farm and suburban people consider first cost, upkeep cost and length of life when they build a home. They will use materials that are reasonable in first cost and will stand for many years without need of repair. They will use materials that ensure long life to the house so that the first cost is spread out over many years of comfortable living.

Concrete masonry construction is reasonable in first cost. Large units are laid up quickly. The mason fits them into the wall without cutting when plans shown in this booklet are used.

ESIGNED FOR COMFORT

3 bedrooms — utility room — kitchen
dining room — living room — basement

★First floor bedroom

★Central hall connecting first floor rooms and back door

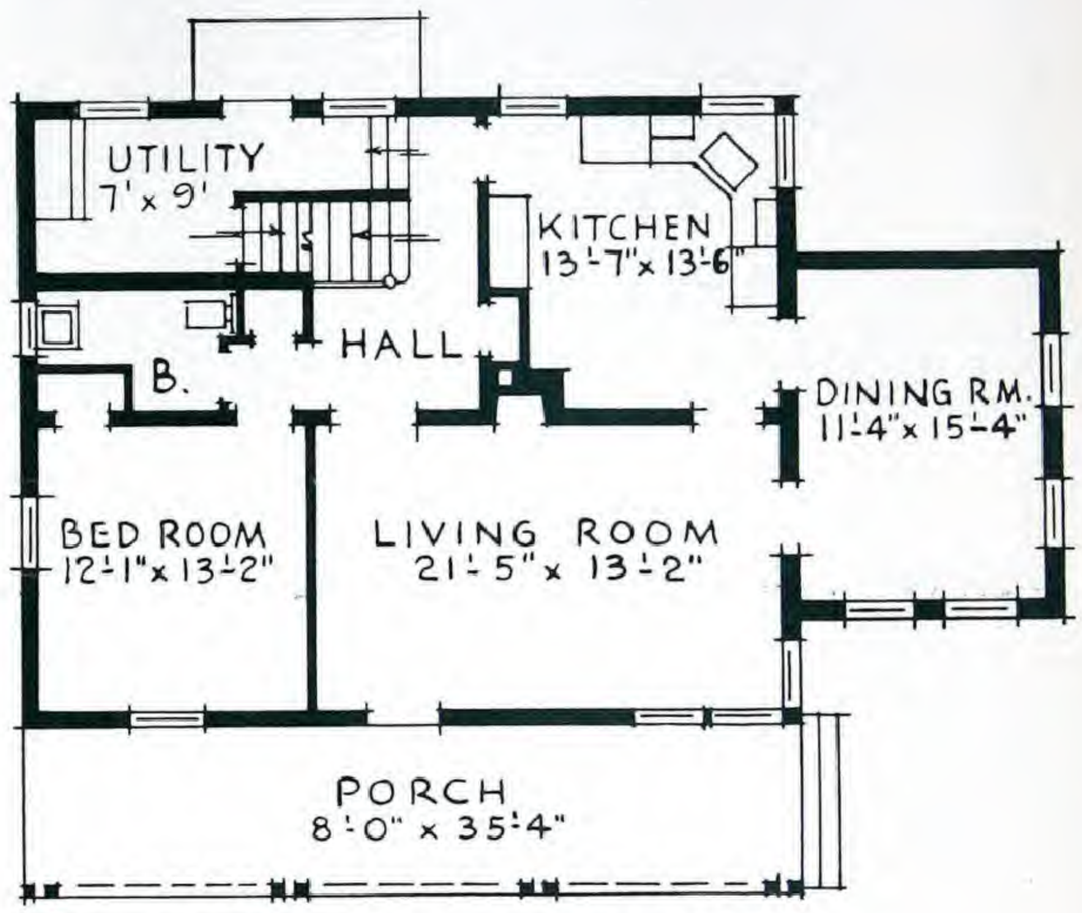
★Bath or washroom on both floors and in basement

★Large front porch

★Corner windows in living room and kitchen

★ Firesafe first concrete floor

★Large basement for food storage and furnace room



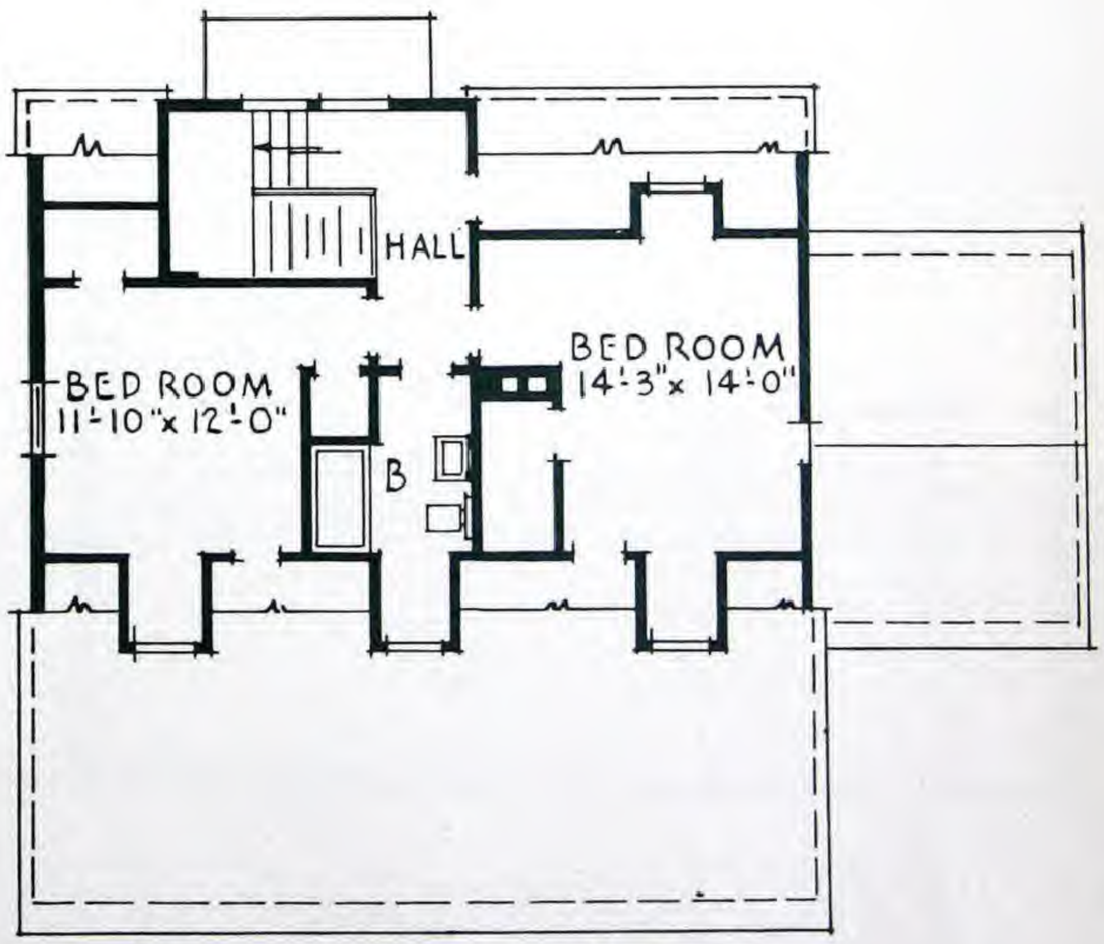
FIRST FLOOR PLAN

construction

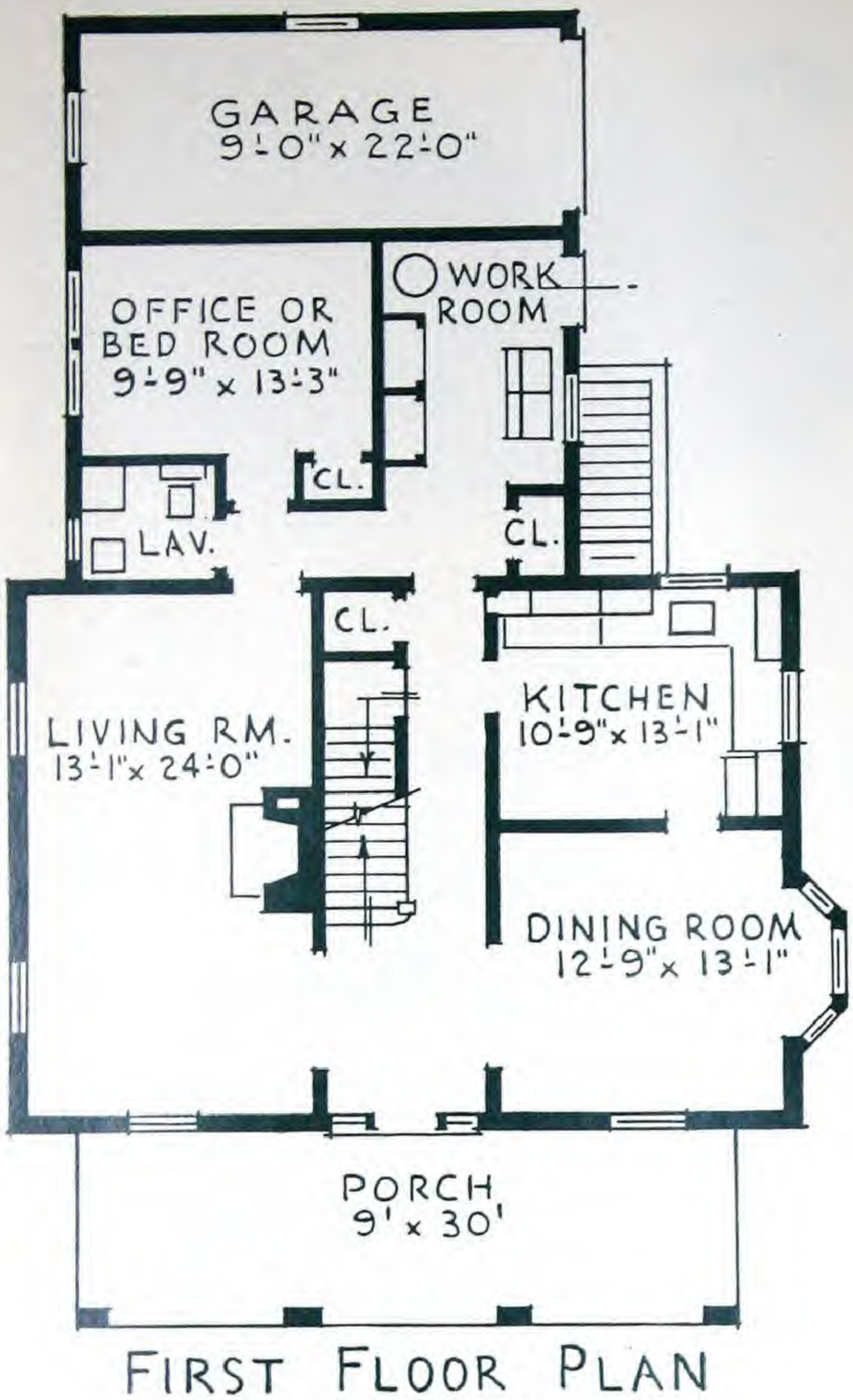
LOW COST

Low-upkeep expense is another characteristic of a concrete masonry house. After many years it stands as straight and strong as when it is first built.

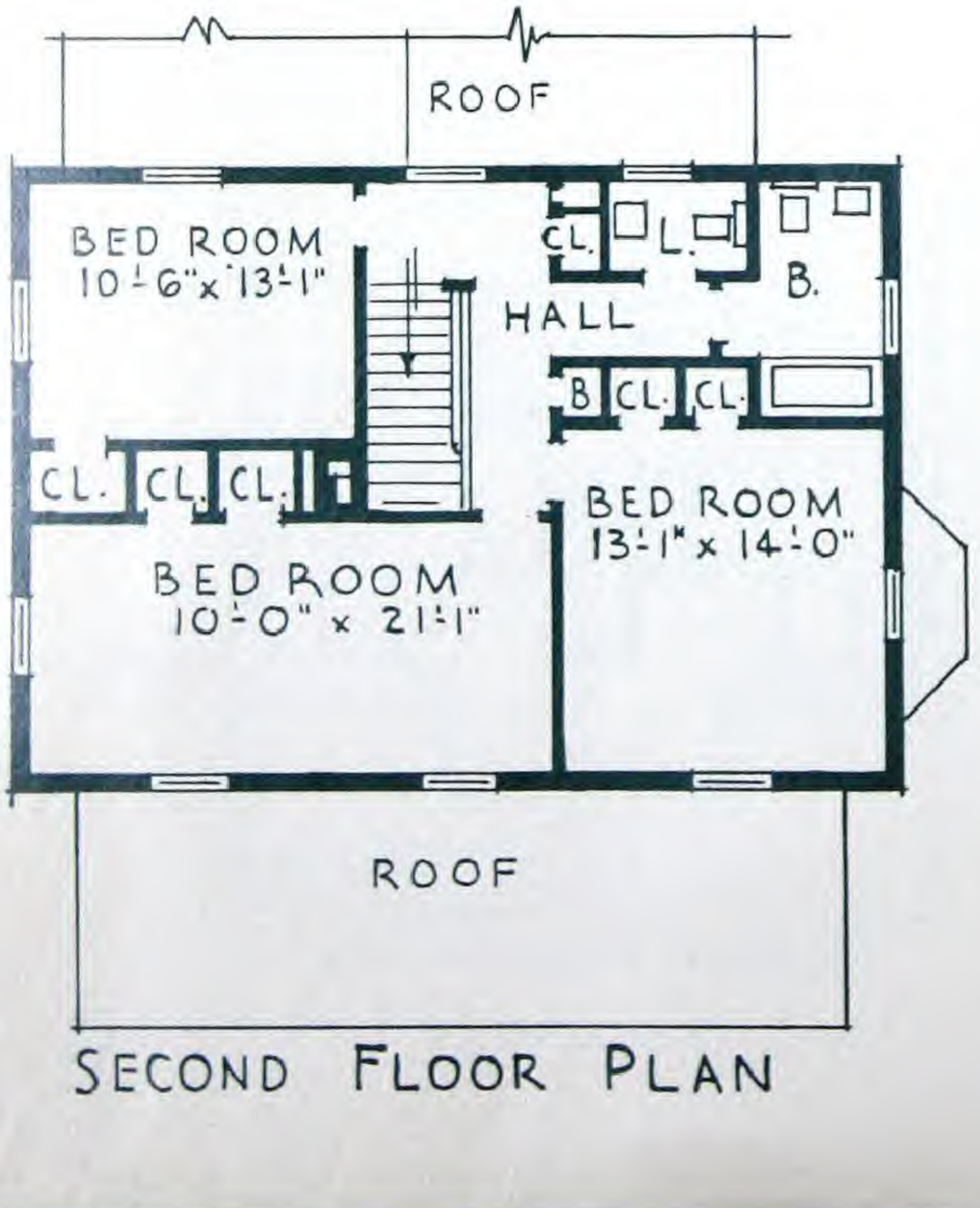
Adding to the life of a concrete masonry home are the characteristic durability and extra strength of the concrete floor. It braces and stiffens the whole house against everyday wear and tear, as well as against violent storms. Photographs on page 19 shows why concrete floors are strong.



SECOND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN

2-STORY HOME

3 bedrooms—utility room—office
kitchen—dining room—living room

Central back hall

Utility room

Bath or wash room on both floors and in basement

Built-in garage

Large front porch

Basement with space for laundry room and food storage

This concrete masonry farm home is warm in winter and cool in summer.

This concrete masonry home harmonizes with the barn and other buildings on the farm. It was built to replace a home destroyed by fire.

Attractive, durable finishes for CONCRETE MASONRY HOMES

A large variety of attractive wall and floor finishes can be applied to concrete masonry homes. Interesting exterior patterns can be worked out by tooling certain mortar joints. Or unusual designs may be worked out with block of different sizes.

Concrete masonry walls can also be made attractive with portland cement paint which will add to their weathertightness. Portland cement paint comes in white as well as other attractive colors and tints. The distinctive, rough texture of the masonry and the mortar joint patterns remain visible when portland cement paint is used—thus retaining the pleasing masonry character.

Concrete masonry provides a durable base for portland cement stucco. Stucco can be given a variety of surfaces such as Spanish, Mexican, or smooth, modern textures, and can be made in many colors to suit the architectural style.

Portland cement stucco finish.

An interesting finish produced by tooled horizontal mortar joints. The wall has been painted with white portland cement paint.

Concrete masonry wall with all joints tooled.

Concrete masonry wall built with different course heights of block.

Comfortable living in CONCRETE HOMES

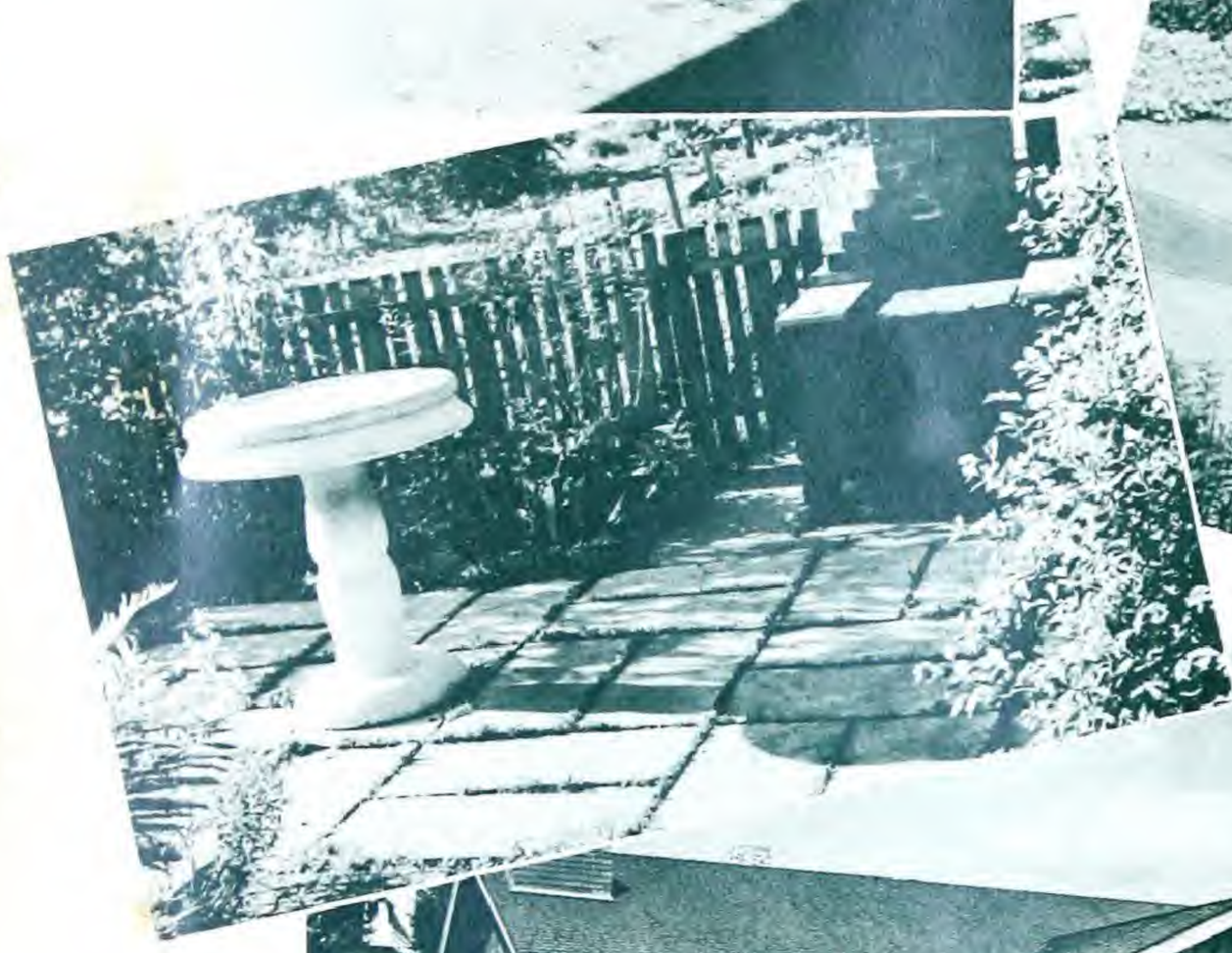
Families in the north, south, east and west—in all climates—are enjoying pleasant, comfortable living in concrete homes.

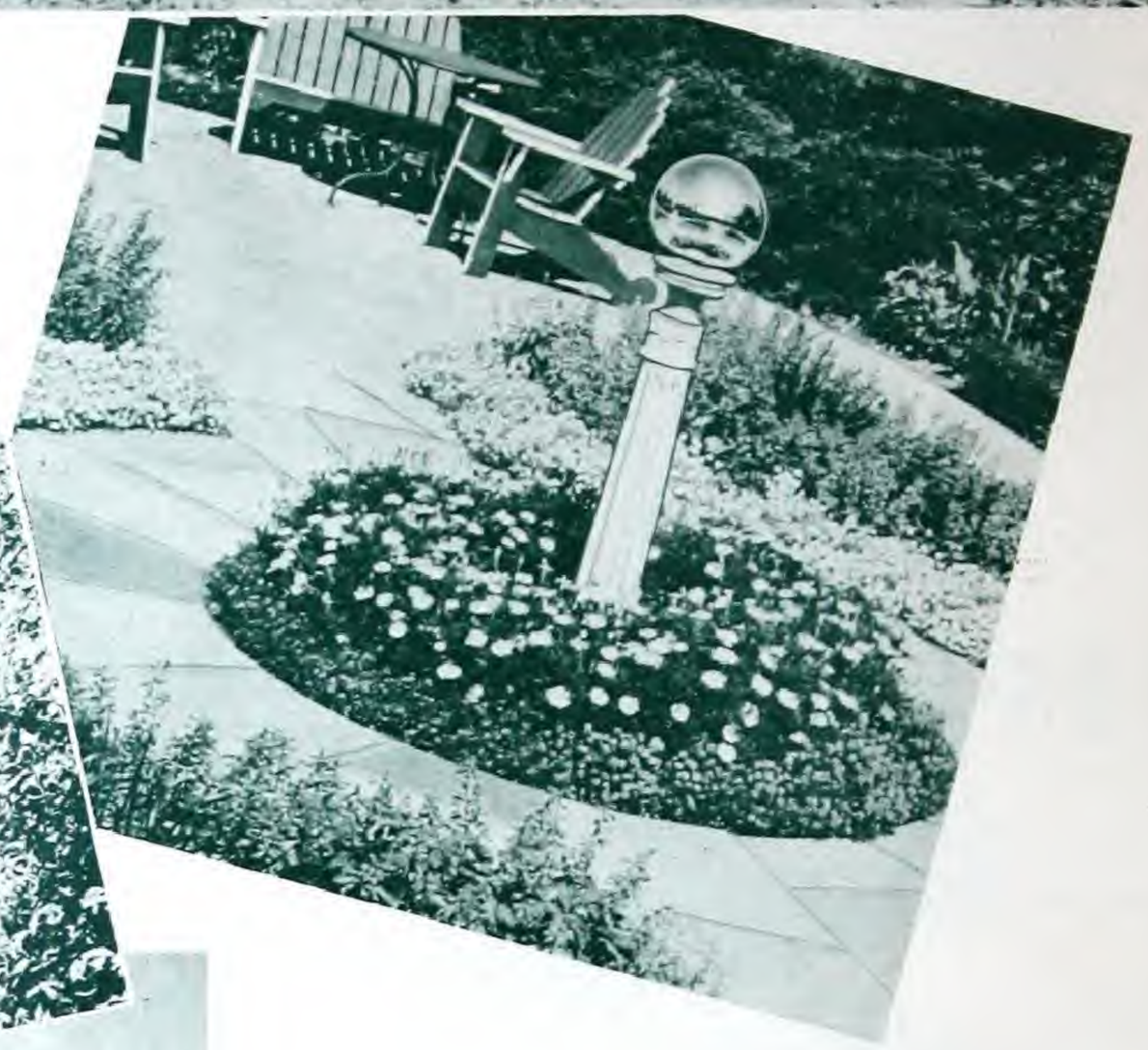
Farm and suburban homes built of concrete are warm in winter, cool in summer. They can be insulated with any of the conventional insulating materials. Your local builder and dealer can give information on what types are available and how much is needed.

TABLE 2 — SUGGESTED CONCRETE MIXES

Kind of Work	Imp. gallons of water to add to each 1-sack batch			Trial mixture for first batch			Maximum aggregate size, inches
	Damp sand	Wet sand	Very wet sand	Cement, sacks	Sand, cu.ft.	Gravel or crushed stone, cu.ft.	
Foundation walls which need not be watertight; footings for walls, columns and chimneys; retaining walls, garden walls.	4 3/4	(Average sand) 4 1/4	3 3/4	1	2 1/2	4	1 1/2
Watertight basement walls, walls above ground, driveways, walks, floors on ground, basement floors, porch floors, paved terraces, concrete steps.	4 1/4	(Average sand) 4	3 1/3	1	2	3	1 to 1 1/2
Suspended reinforced concrete floors of all types; reinforced concrete posts and columns, sills, lintels.	4 1/4	(Average sand) 4	3 1/3	1	2	3	3/4

CONCRETE IMPROVEMENTS make your house and yard more useful and attractive





Several of the many useful and decorative concrete improvements around the home are here illustrated. Instruction for building these and other improvements are given in our booklet, *Concrete Improvements Around the Home*. A copy will be sent free on request.

A QUALITY CEMENT FOR EVERY CONSTRUCTION PURPOSE

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